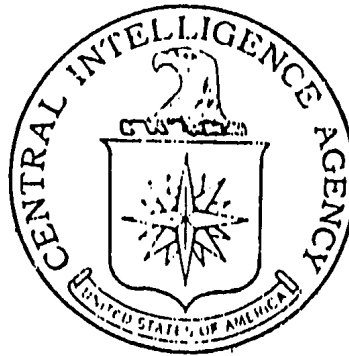


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# SCIENTIFIC INFORMATION REPORT

Number 3

28 March 1958

Prepared by

Foreign Documents Division  
CENTRAL INTELLIGENCE AGENCY  
2430 E. St., N. W., Washington 25, D.C.

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This report presents unevaluated information extracted from publications of the USSR, Eastern Europe, and China. The information selected is intended to indicate current scientific developments and activities in the USSR, in the Sino-Soviet Orbit countries, and in Yugoslavia, and is disseminated as an aid to United States Government research.

SCIENTIFIC INFORMATION REPORT

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NOTE: Items in this report are numbered consecutively.

## I. BIOLOGY

### Radiobiology

#### 1. Possible Causes for Changes in Antigenic Properties of Irradiated Tissues Discussed and Possibility of Protective Serum Explained

"The Question of Noninfectious Immunology in the Problem of the Biological Effect of Ionizing Radiation," by R. V. Petrov, Moscow, MeditSinkaya Radiologiya, Vol 2, No 6, Nov/Dec 57, pp 3-12

The purpose of this report was to analyze scientific literature, to make certain conclusions from the data presented, and to evaluate personal observations in connection with noninfectious immunology in the pathogenesis of radiation sickness. The author reviews pertinent literature covering over 20 years.

Three possible causes are enumerated to explain the onset of changes in the antigenic properties of tissues of irradiated animals: (1) penetration of bacteria from intestinal walls into tissues due to increased permeability of biological barriers, (2) redistribution of protein complexes in irradiated organisms due to tissue destruction, and (3) changes in protein metabolism.

The author analyzes causes of the development of sensitization in radiation sickness. The role of the changed antigens in the pathogenesis of radiation sickness is discussed, and the possibility of obtaining immune serum against these changed antigens is explained.

Further research is recommended on various aspects of noninfectious immunology in the study of malignant neoplasms, thermal burns, and certain other problems connected with noninfectious immunology.

#### 2. Blood Studies Indicate Radiation Effects Most Injurious to Suckling Rats

"Changes in the Morphology of the Blood Picture in Rats of Various Ages Following Acute Radiation Sickness," by T. V. Fokina, Radiobiological Laboratory (head, L. A. Shparo), Institute of Pediatrics, Academy of Medical Sciences USSR, Moscow, MeditSinkaya Radiologiya, Vol 2, No 6, Nov/Dec 57, pp 26-37

The author's aim was to identify characteristic morphological changes in the blood picture of growing animals at various stages of development and to compare them with changes in adult animals.

Reference is made to the scanty work in this field, although the author mentions the works of G. W. Casarett, N. S. Rochester, L. F. Lamerton, L. A. Elson, and W. R. Cristensen.

Blood studies were conducted on 195 young rats (1-10, 11-15, and 16-30 days, and 1-2 and 2-3 months old) and on 14 adult animals. All were irradiated by 250, 500, or 1,000 r. An additional 82 young animals served as controls. Blood studies included leukocyte and erythrocyte counts and hemoglobin content.

Results indicate that (1) in acute radiation sickness changes in the peripheral blood are more pronounced in young rather than in adult rats; (2) various growth periods are distinguished by different features in the development of changes in the peripheral blood following irradiation, for example, leukopenia developed most rapidly in 3- to 6-week-old rats, while in one-day-old sucklings it was delayed but became more severe and was slower in disappearing, than in adults; and (3) greatest injuries were apparent in the red blood of one-day-old sucklings irradiated by 250 r; in this case, despite the low dose of irradiation, hemoglobin concentration decreased to 86% of the initial value, compared with a 13% fall in adult rats.

### 3. Deleterious Effects of Ionizing Radiation Aggravated in Pregnancy

"Specific Changes in the Peripheral Blood of Pregnant Animals Following Single X-Ray Irradiation," by N. M. Andriyasheva, Moscow, Meditsinskaya Radiologiya, Vol 2, No 6, Nov/Dec 57, pp 19-26

To study the changes occurring in the peripheral blood and in the hemopoietic organs of pregnant animals following the effect of ionizing radiation, tests were conducted on pregnant and nonpregnant (control) female albino rats weighing 150-200 g. Various diagrams illustrate changes in hemoglobin content and erythrocyte, leukocyte, and reticulocyte counts in the peripheral blood and hemopoietic organs of experimental and control animals subjected to a single X-ray irradiation by 500 r. Pregnant animals were irradiated either during the middle part of their pregnancy (11th-13th day) or during the latter part (18th-21st day).

Results indicate that (1) anemia appearing in the two groups of pregnant rats following a single X-ray irradiation was more intense and took place sooner in the experimental animals than in the controls; (2) red blood regeneration proceeded more intensely in the pregnant rats than in the controls; (3) leukopenia was slightly more severe and remained longer in pregnant animals irradiated at the end of gestation; (4) the initial leukocyte reaction was similar in all three groups; and (5) qualitative changes in the cells of peripheral blood were more pronounced in the pregnant irradiated animals than in the controls, i.e., more erythrolysis, gigantic hypersegmented neutrophils, increased phagocytic activity of monocytes, and megalocytes appeared.

4. The General Reaction of Animals to Repeated Irradiation by M. L. D.

"Blood Reaction to Repeated X-Ray Irradiation," by M. F. Aleksandrova, Moscow, Meditinskaya Radiologiya, Vol 2, No 6, Nov/Dec 57, pp 12-18

Experiments were conducted on 34 dogs (4 controls) who were subjected to total irradiation doses of 120, 250-320, 400, 500, and 600 r. After 2- to 14-month intervals, these animals were subjected to repeated doses of 275 r.

Results prove that preliminary irradiation of dogs by 120-600 r decreases their resistance to repeated irradiation by the M. L. D. (275 r) of X rays and causes a pronounced rise in mortality rate. Changes in leukocyte and erythrocyte count in the peripheral blood and in cell composition in the bone marrow of these experimental dogs after single or repeated irradiation by 275 r are illustrated in 22 diagrams. These changes are greater, develop more rapidly in animals that were repeatedly irradiated, and take longer to disappear than in those subjected to single irradiation.

The general reaction of animals to repeated irradiation by M. L. D. and the changes appearing in their blood varied, depending on the dose of previous irradiations and on the intervals between them.

5. The Effect of Ionizing Radiation on the Salivary Gland Activity

"The Effect of Single Massive X-Ray Irradiation of the Abdominal Region on the Activity of Salivary Glands," by Prof Yu. N. Uspenskiy, T. A. Timofeyeva, and I. V. Shvartsen, Chair of Normal Physiology (head, Prof Yu. N. Uspenskiy), Astrakhan Medical Institute, Moscow, Meditinskaya Radiologiya, Vol 2, No 6, Nov/Dec 57, pp 37-41

Tests were conducted on six dogs whose parotid ducts were exposed and whose abdominal region was irradiated by 400 and 660 r, total X-ray irradiation.

Results indicate that significant disturbances occur in the secretory activity of salivary glands. These disturbances are reflected in the undulating change of volume of saliva which increases to 1.5-2 times the normal during the 3d-5th days after irradiation, then decreases to

below normal level. Various tables of data, illustrate changes in the trophic activity of the salivary glands. These disturbances include changes in the percentage ratio of organic and inorganic substances and in the specific gravity of the saliva. The appearance of amylase enzyme activity was unpredictable and sporadic.

Through additional experiments using adrenalin and acetylcholine, the author concludes that these disturbances are due to the reaction of the central nervous system, as well as of its vegetative portion.

6. Heart Sensitivity Cardiac Glycosides Increased Temporarily During Acute Radiation Sickness

"Change of Cardiac Sensitivity to Glycosides During Radiation Sickness," by G. S. Koroza, Laboratory of Special Pharmacology (head, V. V. Zakusov, Active Member, Academy of Medical Sciences USSR), Institute of Pharmacology and Chemotherapy, Academy of Medical Sciences USSR, Moscow, Meditinskaya Radiologiya, Vol 2, No 6, Nov/Dec 57, pp 41-44

Radiation sickness was produced in 92 cats by single general irradiation by 150, 300, and 600 r. Indexes for radiation sickness were considered to be the onset of leukopenia, loss of weight, symptoms in electrocardiographic tracings, and histological changes in cardiac tissue.

Results indicate that (1) during the period of acute radiation sickness, i.e., 2 weeks after irradiation by 300 and 600 r, cardiac sensitivity to cardiac glycosides is increased; at this point the amount of preparation necessary to arrest cardiac activity is decreased by 26-38% of the original value, but as recovery progresses cardiac sensitivity is restored to the original; (2) changes in cardiac sensitivity may be connected with the appearance of myocarditis as demonstrated by electrocardiographic and histological studies; and (3) restoration of the changed cardiac sensitivity to cardiac glycosides precedes the disappearance of pathological changes in the cardiac muscle.

Plant Physiology

[See Item No 10.]

## II. CHEMISTRY

### Organic Chemistry

#### 7. Trichlorophosphazoacyl Derivatives

"Trichlorophosphazoacyls, Trichloroisophosphazoacyls, and Their Derivatives," by A. V. Kirsanov and G. I. Derkach, Dnepropetrovsk Metallurgical Institute; Leningrad, Zhurnal Obshchey Khimii, Vol 27 No 12, Dec 57, pp 3248-3254

Trichlorophosphazoacyl derivatives of diphenylchloroacetic, triphenylacetic, and p-nitrobenzoic acids were prepared and their thermal stability was investigated. It was demonstrated that trichloroisophosphazoacyls exist not only for trichloroacetic acid and its analogs, but also for diphenylchloroacetic and p-nitrobenzoic acids. Due to the low thermal stability of triphenylacetylamidophosphoric acid dichloride, trichloroisophosphazotriphenylacetyl could not be prepared. The corresponding di- and tri-a-naphthoxy derivatives were prepared from the synthesized trichlorophosphazo and trichloroisophosphazo compounds and their properties studied. The first crystalline derivative of trichloroisophosphazoacyls, tri-a-naphthoxyisophosphazo-p-nitrobenzoyl, was prepared.

#### 8. A. Ye. Arbuzov's Scientific Activities During and After World War II

"A. Ye. Arbuzov's 80th Birthday," by Gil'm Kamay; Leningrad, Zhurnal Prikladnoy Khimii, Vol 30, No 11, Nov 57, pp 1576

During World War II (1941-1945), A. Ye. Arbuzov and his co-workers G. Kh. Kamay and A. I. Razumova directed the production of  $\gamma$ -phenylpropyl alcohol from ethyl ethyl cinnamate by a method developed and improved by this group. This was in response to an order from the State Committee on Defense. The yield of high quality  $\gamma$ -phenylpropyl alcohol was as high as 94%. During these same years, Arbuzov synthesized considerable quantities of  $\gamma$ ,  $\delta$ -dipyridyl and certain important dyestuffs needed at the front.

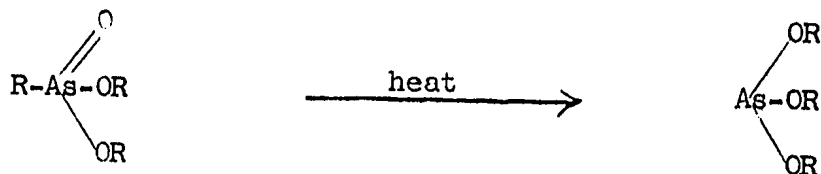
Beginning in 1947, Arbuzov and workers in his laboratory of organic chemistry at the Chemical Institute, Kazan Affiliate, Academy of Sciences USSR, devoted and are continuing to devote a great deal of attention to the development of an industrial method of producing ethyl pyrophosphate. This compound was first prepared in a pure form in 1932 by A. Ye. and B. A. Arbuzov. In these same years, A. Ye. and B. A. Arbuzov first synthesized and thoroughly investigated still other esters of pyrophosphoric and monothiopyrophosphoric acids.

In 1948, a group of chemists at the Kazan Affiliate, Academy of Sciences USSR, under the direction of A. Ye. Arbuzov synthesized a large number of new organophosphorus compounds. Of the many hundreds of these compounds synthesized, the following four were the most investigated and seemed to be the most useful as insecticides: tetraethylpyrophosphate (TEPP), tetraethylmonothiopyrophosphate (Pyrophos), tetraethyldithiopyrophosphate (Dithiophos), and octamethyltetraamidopyrophosphate (octamethyl).

#### 9. Reverse Arbuzov Rearrangement Described

"Basic Courses in the Development of Soviet Chemical Science," by Academician I. L. Knunyants; Moscow, Khimicheskaya Nauka i Promyshlennost', Vol 2, No 5, May 57, p 543

Ya. F. Komissarov discovered a very interesting rearrangement in the arsenic-organic series of compounds, i.e., a reverse Arbuzov rearrangement. He demonstrated that esters of alkylarsenic acid readily isomerize into esters of arsenous acid on heating:



The remainder of the article is a general review of chemical developments in the USSR.

#### Physical Chemistry

#### 10. Photosynthesis Conference

"Second All-Union Conference on Photosynthesis," by Yu. A. Vladimirov, S. V. Konev, and F. F. Litvin; Moscow, Zhurnal Fizicheskoy Khimii, Vol 31, No 8, Aug 57, pp 1908-1911

CPYRGHT The following are excerpts from the article.

"The second all-union conference on photosynthesis was held in Moscow from 21 to 26 January 1956. A total of 129 reports were read and discussed. The conference was divided into nine sections: photochemistry, chloroplasts, physiology of photosynthesis, physical forms of pigments, photosynthesis of algae, photosynthesis of microorganisms, products of photosynthesis, light culture, and methods of research. The report on this conference covers the most interesting problems from point of view of physical chemistry. They are photochemistry, the chemistry of photosynthesis, and utilization of tracer atoms in research.

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"The results of the conference demonstrated that considerable success could be achieved and much benefit realized from the combined efforts of specialists in various scientific fields of endeavor, i.e., biology, chemistry, physics, and physical chemistry.

"Academician A. N. Terenin, in the first half of his report, discussed photochemistry of photosynthetic pigments. He presented a detailed analysis of various methods of initial conversion of a quantum of energy of red light absorbed by molecules of chlorophyll. Academician A. N. Terenin talked at length on the subject of the age of an activated chlorophyll molecule. This is important, because the possibility of further utilization of the energy of a stimulated chlorophyll molecule is dependent on its stage of life.

"The index of the metastable condition of a molecule is its phosphorescence. A study was made to determine the reactive capacity of a stimulated molecule and that of a metastable molecule. The experiments conducted consisted of extinguishing the fluorescence and phosphorescence of a chlorophyll by means of ascorbic acid and phenylhydrazine which cause reversible photoreduction. Another method used to find the age and the reactive capacity of a metastable chlorophyll molecule was by means of powerful spontaneous irradiation."

"The last half of the report of A. N. Terenin was on the subject of migration of energy and electrons within pigments which are in a condensed physical form. A. N. Terenin said that experiments conducted by him confirmed the possibility of transfer of energy not among the stimulated molecules of the pigment, but among the triplet levels of the neighboring pigment molecules (a biradical exciton). Migration of energy within the colloidal particle of a chlorophyll was confirmed experimentally. A. N. Terenin connects the results obtained with the hypothesis that a photosynthetic 'unit' is an aggregate of molecules of the pigment united into a single mass by migration of a quantum of energy. To this hypothesis he added an assumption concerning the migration of a quantum of energy along the metastable levels and also migration of the electron interstice."

"The report, read by A. A. Krasnovskiy, attempted to throw light on photobiochemical participation of pigments in the reactions of photosynthesis. Reversible photochemical reduction of pigments is the basis for these reactions. A. A. Krasnovskiy noted that, in the past few years, it was discovered that changes taking place in the spectrum of absorption of pigments in living cells are similar to changes that take place in the spectrum of absorption of photoreductive forms of chlorophyll. A. A. Krasnovskiy noted that the greatest majority of chlorophyll molecules are in an aggregated state and photochemically appear to be in an inactive state. A certain portion of the chlorophyll is in a monomeric, active state photochemically."

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"L. A. Tumerman talked at length about the period of time that chlorophyll molecules remain stimulated in a solution of alcohol and in leaves. It was found that the time period was almost the same in both cases. A fluorometer was used to measure the fluorescence. In view of the fact that information found in the literature maintains that the quantum yield of fluorescence in leaves is somewhat lower than in alcohol solution, it can be said that L. A. Tumerman has made an important inference in that the duration of extinction of fluorescence in a leaf is considerably shorter than the life span of a molecule in a state of stimulation. L. A. Tumerman said that this confirmed the assumption that there were two forms of chlorophyll in leaves: fluorescent, and nonfluorescent. Furthermore, this information proves the existence of a photosynthetic unit and that migration of energy takes place within it."

"V. B. Yevstigneyev spoke on the mechanism of photoreduction of chlorophyll. He said that, by means of spectrophotometric and electrometric methods of research, he demonstrated that photoreduction of chlorophyll and its analogs in solutions passed through a stage of forming a reduced form of pigment which was quite labile, reactive, and electrode active and possessed properties of a free radical, i.e., an ionized semiquinone."

"G. P. Brin said that ascorbic acid, cysteine, polyphenols, cystochrome C, and a number of other compounds were capable of photo-oxidation in the presence of chlorophyll."

"K. K. Voytyashskaya and A. A. Krasnovskiy reported that bacteriochlorophyll also had the capacity to reverse photochemical oxidation and reduction and was capable of forming photoproducts that were active, labile, and reversely reactive. The spectra of absorption of bacteriochlorophyll in a living photosynthesizing bacteria correspond to the spectra of absorption of aggregated forms of bacteriochlorophyll."

"Ye. K. Bessyko said that she discovered that chlorophyll and its derivatives, absorbed in semiconductors like zinc oxide and mercury oxide, cause powerful sensitization of the photoelectric effect of those semiconductors. The mechanism of this sensitization is considered by her to be the transfer of energy from the pigment to the electrons of the semiconductor located in pits near the surface with subsequent detachment of electrons from those pits."

"The report of H. I. Kobozev, L. I. Nekrasov, and I. M. Podgornyy showed that diamagnetic crystalline chlorophyll acquired paramagnetic properties after adsorption."

"B. Ya. Dain and M. S. Achkintzi analyzed the possibility of intra-complex transmission of electron during photosynthesis."

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"A. N. Sidorov described work done on the effects of a central metal atom on chlorophyll molecules along the infrared spectra of absorption. Analysis of these spectra showed that the central atom of metal had a substantial effect on the molecules of pigment. It also effected the peripheral groups of atoms."

"G. P. Gurinovich, I. N. Yermolenko, A. N. Savchenko, and K. N. Solov'yev made a study of absorption spectra and luminiscence of chlorophyll and metalloderivatives of pheotophyn...." "Basing their opinion on data dealing with the polarization of luminiscence, the authors calculated the angles of oscillators and proved the dipole character of the processes of absorption and irradiation of chlorophyll."

"S. V. Konev showed that intramolecular migration of energy took place within the phycoerythryn of the photosynthetic pigment of red algae. This was demonstrated by the polarization method of fluorescence and by determining the relative quantum yield during stimulation with light of various wavelengths."

"Yu. A. Vladimirov spoke on the same subject. He paid particular attention to the study of the mechanism of migration of energy in a protein system."

"G. A. Korsunovskiy performed certain model experiments dealing with water oxidation on the surface of the conductor of a sensitizer."

"The mechanism of oxidizing-reduction conversion of chlorophyll in the course of the process of photosynthesis was discussed by V. N. Kutyurin. The interchange of hydrogen atoms of chlorophyll that was observed during photosynthesis was not very significant."

"V. V. Yevtigneyev observed that, during irradiation of aqueous suspensions from leaves, light is absorbed only by the chlorophyll. L. N. Bell showed by a method of two-ray differential photometry that light causes reversible spectral changes in leaves of plants. The kinetics of spectral changes in leaves point to the existence of two processes that differ both in speed and in the nature of the material changes which occur."

"L. M. Vorob'yeva showed spectrophotometrically that, together with stable aggregated form of chlorophyll, a rapidly fading, monomeric, active form of chlorophyll can also be found in aqueous glycerine colloidal extracts of plant leaves."

"The tracer atom method has been widely used in the study of various photosynthesis problems. Radioactive isotopes have been utilized in the study of products of fixation and reduction of  $\text{CO}_2$  ( $\text{Cl}^{14}\text{O}_2$ ), of the chemistry of chlorophyll formation (T. N. Godnev and A. A. Shlyk), and of the intensity of photosynthesis under various conditions, and of the productivity of photosynthesis."

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"Study of the primary products of photosynthesis was discussed by Ye. A. Boychenko. She said that she thinks that hydroxy acids  $(\text{CHOH})_m(\text{COOH})_n$  which contain phosphorus and iron and the primary products of photosynthesis."

"In using the isotope method, N. G. Doman obtained new data which prove the existence of labile fixation of  $\text{CO}_2$ , possibly proceeding the stage of phosphoglyceric acid formation."

"M. V. Turkina discussed the formation of the principal carbohydrates during the process of photosynthesis. A brief exposure of plants (5 minutes), which have accumulated many different carbohydrates, revealed that the main mass of  $\text{C}^{14}$  seemed to be in saccharose form. When the plants were placed in an atmosphere of 'nontracer' carbon dioxide, the  $\text{C}^{14}$  disappeared from saccharose and accumulated in other carbohydrates. This made it possible for M. V. Turkina to devise a schematic representation of sugar formation.

"T. F. Andreyeva made a study of the synthesis of protein in a photosynthesized leaf. Using isotope  $\text{N}^{15}$ , she succeeded in showing that inorganic nitrogen becomes fixed in amino acids and in the protein of a leaf during earliest exposures. She showed that the products of photosynthesis which contain nitrogen, not the carbohydrates alone, shift from the chloroplasts into the plasma of cells and further into other organs of the plants."

"A. M. Kuzinyy and G. N. Sayenko showed that the oxidizable substances of  $\text{C}^{14}\text{O}_2$  in a leaf are the low molecular compounds.

"V. A. Chesnokov, A. A. Baskakova, L. S. Belozeroval, and N. S. Mamushina had a different explanation of the action of light on the protein synthesis.

"N. P. Voskresenskaya analyzed the role of spectral composition of light in the conversion of carbon. M. V. Ulubekova discussed the results of her analysis of the isotope composition of oxygen of algae cells during photosynthesis. She used the isotopes  $\text{O}^{18}$  and  $\text{C}^{14}$ ."

"Yu. I. Sorokin talked on the subject of the production of the phytoplankton in water reservoirs by means of photosynthesis. He said that his was of great practical significance and that it could also be solved by making use of tracer carbon."

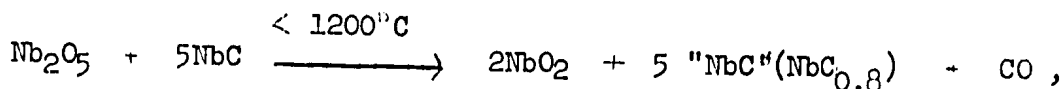
"The distribution of activity in the chromatogram spots of various pigments was discussed by S. I. Lebedev."

Nuclear Chemistry and Technology11. Process for the Production of Ductile, Very Pure Niobium

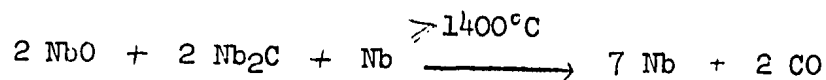
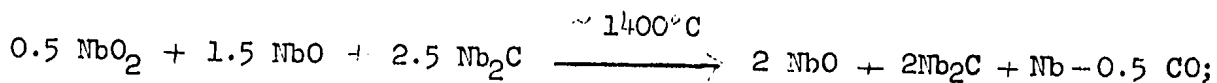
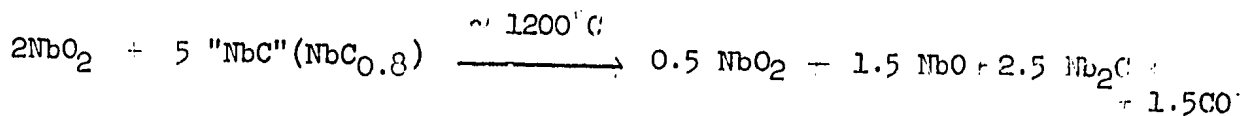
"The Production of Ductile Niobium," by O. P. Kolchin, N. V. Sumarokova, and N. P. Chuveleva, Moscow, Atomnaya Energiya, Vol 3, No 12, Dec 57, pp 515-524

The properties of niobium which are of interest from the standpoint of the use of the metal in nuclear engineering are reviewed in brief. Some problems hitherto not treated in the literature are discussed which pertain to the sodium-thermic and carbide (carbothermic) methods of producing niobium followed by sintering.

The production of a powder containing 98.9-99.2% of Nb by the reduction of potassium fluoroniobate ( $K_2NbF_7$ ) with sodium and subsequent production of ductile niobium by sintering small rods pressed from this powder are described in detail. The conditions under which ductile niobium is obtained by the carbothermic method are outlined briefly. Investigation of the phase composition of products of incomplete reduction of a mixture of niobium pentoxide with niobium carbide established that the principal reaction of reduction in vacuum represents a sum of the following successive reactions:



where "NbC" is a phase of variable composition;



Special experiments have shown that one of the important stages of the conversion which has been selected is the interaction of vapors of lower niobium oxides with niobium carbides. As a result of the reduction with carbide and sintering accompanied by refining, ductile niobium is produced which has the following composition:  $\geq 99.98\%$  of niobium plus tantalum (less than 0.1% of the latter),  $(2.5-7) \times 10^{-3}\%$  of oxygen, (3-10)

$10^{-3}\%$  of carbon,  $4 \times 10^{-5}\%$  of tin, less than  $1 \times 10^{-3}\%$  of silicon, sulfur, phosphorus, copper, arsenic, calcium, and magnesium, less than  $1 \times 10^{-4}\%$  of lead, bismuth, cadmium, and hydrogen, less than  $3 \times 10^{-3}\%$  of titanium, less than  $2 \times 10^{-3}\%$  of iron, and less than  $1 \times 10^{-5}\%$  of antimony. The direct transfer of niobium into the sintered metal is no less than 96%.

On the basis of the investigation which has been conducted, it is concluded that the carbide method of producing niobium presents the following technological and economic advantages: (a) technical niobium pentoxide and a cheap reducing agent (carbon) are used, (b) the product is a compact metal which can be sintered and melted in an electric arc (c) the reduction and sintering take place within a short period of time, (d) there is a high degree of direct conversion of niobium into metal and (e) very pure ductile niobium is obtained even when the niobium pentoxide used as the starting material is contaminated with impurities.

#### Radiation Chemistry

##### 12. Recent Work in the Field of Radiation Chemistry

"The Chemical Action of Ionizing Radiation," by B. L. Tsetlin, Candidate of Chemical Sciences, and Sh. A. Karapetyan, Candidate of Technical Sciences, Institute of Organoelemental Compounds, Academy of Sciences USSR; Moscow, Priroda, Vol 46, No 12, Dec 1957, pp 55-57

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"Among the many new fields of scientific research which came into being because of the rapid development of the nuclear energy industry, radiation chemistry occupies a prominent place. Radiation chemistry studies chemical transformations brought about by the action of ionizing radiation. The energy of quanta of this type of radiation is many times larger than that of any chemical bond or that necessary for the activation of any chemical reaction. Because of this, the chemical action of ionizing radiations has important distinguishing characteristics.

"The extensive problem of the utilization of nuclear energy for peaceful purposes set to radiation chemistry the urgent problem of finding ways to utilize the huge amount of radiation energy emitted by radioactive substances for the purpose of conducting useful chemical reactions and obtaining new synthetic products.

"Under the circumstances, the interest which the All-Union Conference on Radiation Chemistry held in March 1957 in Moscow by the Department of Chemical Sciences, Academy of Sciences USSR, and the Ministry of Chemical Industry USSR elicited among wide circles of chemists is quite understandable.

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To this interest testify the large attendance at the conference (in excess of 700) and the lively discussions which took place at all of the 11 sessions of the conference. A total of 56 reports in the principal subdivisions of radiation chemistry was presented at the conference. Noted foreign scientists participated. They came from Yugoslavia, China, Poland, Bulgaria, Czechoslovakia, and Hungary.

"The first session dealt with the most important theoretical problems pertaining to the initial stages of radiation-chemical transformations. As a result of the primary interaction of radiation with molecules of the substance being irradiated, various intermediate particles arise, among which ions and free radicals are of the greatest importance; their subsequent transformations determine the course of the process as a whole. Soviet scientists are doing productive work in the investigation of these elementary processes.

"The participants in the conference learned about interesting results of mass-spectrometric investigations in which was determined the nature of the ions that are formed in the first stages of some radiation-chemical reactions as well as the nature of the interaction of these ions with the molecules of the initial substance. The application of the method of electronic paramagnetic resonance appears to be very promising in radiation chemistry. The use of this method opens up possibilities of studying directly the free radicals which play a very important role in radiation processes. The first results of the application of this method which were reported at the conference indicated that the assumption in regard to the value of the method of electronic paramagnetic resonance in radiation-chemical research is correct.

"The greatest number of papers dealt with the action of radiation on aqueous solutions of inorganic and organic substances. The radiolysis of dilute aqueous solutions is determined by the interaction of intermediate products of the radiolysis of water (principally H atoms and OH and H<sub>2</sub>O<sub>2</sub> radicals) with the molecules of the dissolved substance. In concentrated aqueous solutions, in addition to indirect action, the direct action of radiation on the molecules of the dissolved substance also becomes of importance. It was shown in a number of reports that in some cases one may accelerate and control the radiolysis of aqueous systems by adding small quantities of inorganic or organic substances. Great interest was elicited by reports which dealt with phenomena of radiation electrochemistry. Soviet scientists have made an important discovery in this field: they established that in principle it is possible to transform the energy of radiation into electric energy in radiation-activated galvanic cells. The action of radiation produces a constant difference of potential between the electrodes of such cells. An instance of a cell of this type is a system in which an aqueous solution of an acid or alkali serves as the electrolyte and the electrodes consist of platinum and gold. This cell is subjected to the action of gamma rays. The cell operates as

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a result of electrochemical reactions leading to the formation of water molecules from the primary products of the radiolysis of water (H and OH). Another radiation-activated galvanic element is based on the redox reaction  $\text{Fe}^{2+} \rightarrow \text{Fe}^{3+}$ . Although it is too early to speak of a practical application of phenomena of this type, their application is of equal importance for the development of both radiation chemistry and electrochemistry. One may hope that further work in this direction will enable us to approach the practical application of radiation-activated galvanic cells. The investigation of processes of radiation electrochemistry is also of great importance from the standpoint of another major problem, that of the corrosion of metals under the action of radioactive solutions. New data were reported at the conference which have a bearing on the relationships underlying corrosion processes and the possibilities of inhibiting them.

"One of the sessions dealt with the radiation-chemical transformations of substances that participate in biochemical processes. On exposure to radiation proteins, carbohydrates, fats, and nucleic acid compounds undergo profound chemical transformations which play a definite role in radiobiological processes. It was at the same time indicated that an understanding of the fundamental relationships which determine the action of radiation on living organisms is impossible without the employment of specifically biological concepts, because biological changes in the organism occur already at doses of radiation which produce only insignificantly small chemical transformations. A close collaboration between biologists, biochemists, and physical chemists is necessary for a solution of the most important problems in this field.

"Problems of the radiation chemistry of organic substances were discussed at four sessions of the conference.

"Organic substances, which under the action of radiation undergo the most diverse transformations, are probably the most interesting object of radiation-chemical research. Data have been obtained which indicate that it is possible in a number of cases to conduct radiation-chemical transformations in such a manner that practical use is made of the phenomena in question. A number of papers was given on the radiation chemistry of simple organic systems. These papers dealt with radiation-chemical oxidations, halogenations, and the radiolysis of hydrocarbons. It was brought out, for instance, that the radiation-chemical chlorination of benzene, which leads to the production of hexachlorane, presents many advantages over the photochemical process that is being applied on an extensive scale in the industry at present. There is every reason to believe that the radiation-chemical chlorination of benzene will be applied industrially. Theoretical problems pertaining to this subdivision of radiation chemistry were also discussed, specifically, phenomena of the transfer of energy in mixtures of organic substances and the characteristics of the action of different types of ionizing radiation.

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"Of great importance is that field of radiation chemistry which studies the action of radiation on high-molecular substances. The reason for this is the great practical importance which work in this field has for the development of polymers that are stable as far as the effects of radiation are concerned. This applies to different types of rubber, plastics, and synthetic fibers. On the other hand, one may be using radiation change the properties of polymers in many cases, thus employing radiation-chemical processes for the improvement of the quality of materials. Reports presented by Soviet scientists at the conference dealt with both aspects of the action of radiation. The factors were investigated which have an effect on the direction in which changes of the molecular structure of polymers proceed and the velocity with which these changes occur. It was established in what cases there is splitting of long linear molecules which results in a lowering of the average molecular weight of the polymer and in what cases there is formation of linkages between chain macromolecules, so that the network structure arising in radiation vulcanization appears.

"Problems which have a bearing on the mechanism of these processes were discussed at the conference. Data were reported on the relationships which determine the destruction of various polymers as a result of exposure to radiation, particularly the destruction of vitreous polymers, and also the disruption of the initial structure of crystalline polymers.

"Soviet scientists have achieved definite progress in the vulcanization of rubber by radiation. It was established that the radiation vulcanization of different types of rubber has a number of advantages over ordinary sulfur vulcanization. The radiation-vulcanized products exhibit a high degree of resistance to heat, a high resistance to repeated deformations, and other valuable properties. Vulcanization by radiation can be conducted at room temperature and does not require the addition of vulcanizers. It can be conducted in cases when other kinds of vulcanization are not feasible or can be conducted only with great difficulty (e.g., vulcanization of polyethylene or of silicone rubber). It seems that results obtained in the field of the polarization chemistry of polymers are of the greatest practical importance at present.

"The last session of the conference dealt with new sources of radiation for radiation-chemical research. These sources have been developed at the Institute of Physical Chemistry, Academy of Sciences USSR, and the Physicochemical Institute imeni L. Ya. Karpov. The participants in the conference familiarized themselves with new powerful X-ray installations and gamma radiation installations at the laboratories of the institutes mentioned.

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"In addition to reviewing the achievements of Soviet scientists in all field of radiation chemistry, the conference that has been held will contribute to the unification of effort in the solution of the most urgent and important problems of this most interesting field of chemical science, in order that the results obtained in research may be applied to practically useful ends in the near future and penetrating radiation, which is another enemy of all that lives, will be employed for the benefit of humanity."

13. Present-Day Trends in the Fixation of Nitrogen

Azot (Nitrogen), by V. I. Medvedovskiy, Popular Science Series published by the Academy of Sciences USSR, Moscow, 1957, 166 pp, reviewed by Prof D. A. Epshteyn; Moscow, Priroda, Vol 46, No 12, Dec 57, pp 120-121

CPYRGHT After pointing out numerous errors in Medvedovskiy's book and correcting these errors, the reviewer outlines current tendencies in the industrial fixation of nitrogen as follows:

"The book does not adequately treat the problem of the production of nitrogen compounds from molecular nitrogen from either the historical or the technological standpoint. The subject is important, because the history of the discovery and industrial application of the synthesis of ammonia is connected with the development of such basic subdivisions of chemistry as the theory of chemical equilibrium, chemical kinetics (especially as far as problems pertaining to catalysis are concerned), and the solution of such very difficult engineering problems as the designing of equipment for carrying out reactions at pressures of hundreds of atmospheres and temperatures exceeding 500°. As far as the method of fixing nitrogen in an electric arc is concerned, it lost its practical importance long ago, notwithstanding the statement made by Medvedovskiy on page 73 of the book. At present the possibilities of the thermal method of fixation of nitrogen are being investigated. In this method, heating of the air to a temperature slightly above 2,000° is achieved by a procedure involving the combustion of gas and recovery of the heat. Most promising from the practical standpoint is apparently the possibility of oxidizing nitrogen under the effect of radiation. This oxidation can be preformed directly in a nuclear reactor. This direct transformation of nuclear energy into chemical energy (without intermediate stages) will make it possible to increase sharply the efficiency of the utilization of energy and presents interest both as a method of effective application of nuclear energy and a procedure for the production of nitrogen fertilizers at low cost."

14. Radiation-Activated Decomposition of Hydrogen Peroxide at Concentrations of 2-92 Mol %

"Kinetics of the Decomposition of Hydrogen Peroxide Under the Action of Radiation," by V. Ya. Chernykh, S. Ya. Pshezhetskiy, and G. S Tyurikov, Physicochemical Institute imeni L. Ya. Karpov; Moscow, Doklady Akademii Nauk SSSR, Vol 115, Jul 57, pp 560-563

The kinetics of the decomposition of hydrogen peroxide in aqueous solutions under the action of ionizing radiation had been studied in a number of investigations. However, the work in question dealt with dilute solutions and the results were not in mutual agreement, because different, rather narrow ranges of concentration were investigated. In this instance, the kinetics of the decomposition of hydrogen peroxide in the concentration range of 1.78-92.23 mol % under the action of gamma-radiation emitted by a  $\text{Co}^{60}$  source with an activity of 80 curies were studied. The results obtained were compared with the kinetics of the thermal decomposition and photochemical decomposition of  $\text{H}_2\text{O}_2$  under the action of ultraviolet radiation. It was found that the nature of the decomposition reaction, as characterized by the dependence of the velocity of decomposition on the concentration and some other factors, is the same in all cases, indicating that the principal mechanism of the reaction is independent of the type of initiation. This is characteristic for chain reactions.

The ionic nature of the decomposition of hydrogen peroxide is assumed on the basis of other published data, and the elementary stages of the reaction, together with the velocity constants corresponding to these stages and their relationship to the over-all velocity constant of the reaction, are discussed and used to derive an equation expressing the over-all velocity of the reaction. This equation is found to be in agreement with experimental data.

Radiochemistry

15. USSR Developments in the Field of Radiochemistry

"The Principal Trends and Results of the Development of Chemistry in the USSR During 40 Years," by N. A. Domnin; Moscow, Zhurnal Obshchey Khimii, Vol 27, No 10, Oct 57, pp 2609-2629

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"At present the USSR has a powerful radiochemistry industry, which is based on the utilization of crude material discovered and exploited during the past 40 years.

"The development of radiochemistry in the USSR began in the 1920s. It was initiated by V. G. Khlopin, who synthesized the first radium compound in the USSR and organized, together with Vernadskiy, the Radium Institute in 1922. Since then, research in the field of radiochemistry has developed rapidly on a broad scale in all its principal aspects. Khlopin founded a school in which capable scientists such as B. A. Nikitin, A. Ye. Polesitskiy, A. P. Ratner, and V. I. Grebenshchikova were trained. He discovered the law of the distribution of radioactive elements between liquid and solid phases. This law is of primary importance in the investigation of conditions under which radioactive elements can be isolated from dilute solutions. The law of distribution proved to be applicable to systems in which the element that is distributed is isomorphous with a solid crystalline phase. The problem in regard to the mechanism of isomorphous displacement in the formation of mixed crystals was studied in detail and the substances involved were classified from this standpoint. It was furthermore established that the application of Khlopin's law of the distribution of radioactive elements between the solution and a crystalline precipitate of some salt proves that there is a true isomorphism between the compound of the microcomponent in question and the substance of the solid phase and that consequently there is a similarity between the chemical composition and the structure of the two substances.

"In research that has been done subsequently, this postulate made it possible to prove the existence of a number of molecular compounds of radon and to begin the investigation of chemical compounds of noble gases. This research was done by Nikitin. Work on the distribution of elements was extended to melts. Investigations were made on the distribution of radioactive elements between two immiscible solvents (B. A. Nikitin and others).

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"In connection with the use of nuclear energy for peaceful purposes Soviet chemists had to pay particular attention to the development of extraction and adsorption methods for the isolation of radioactive elements which are of importance in practical industrial work. The mechanism of the extraction of radioactive isotopes from aqueous solution with organic solvents was investigated in detail from this standpoint (Vdovenko and his collaborators).

"Many investigations dealt with the adsorption of radioactive elements (Khlopov, Nikitin, Ratner, I. Ye. Starik, Nikol'skiy, and others). The work that has been done on the distribution of elements and adsorption processes formed the foundation for the development of industrial procedures for the separation and purification of radioactive elements.

"The separation of uranium from thorium was investigated in an extensive range of thorium concentrations and the chromatographic purification of solutions contaminated with microquantities of zirconium and niobium was developed. A method was devised for investigating processes of complex-formation in solutions by simultaneous adsorption of the central ion with an anionite and cationite (Nikol'skiy and his pupils). The selective adsorption of some radioactive elements on ion-exchange resins, silica gel, and other porous adsorbents was studied (Nikol'skiy and D. N. Strazhesko). By investigating the adsorption of polonium and the colloidal properties of this element, the actual existence of true colloids of radioactive elements was proved (Starik). Work has been done on the application of natural radioactive elements as tracers in analytical chemistry (Viktor I. Spitsyn and Starik).

"The application of artificial radioactive elements as tracers was already realized in the 1930s in the investigation of many fundamental problems such as the nature of the chemical bond, isotope exchange between solid phases and solutions, the structure of complex compounds, and the kinetics and mechanism of catalytic reactions (Grinberg, Polesitskiy, and Roginskiy). Subsequently, the method of tracer atoms was applied in the most diverse fields of chemistry (Brodskiy, A. N. Nesmeyanov, Alimarin, Spitsyn, Fialkov, Syrkin, D. N. Kursanov, Razuvaev, and others).

"After World War II, the chemistry of nuclear transformations and the chemistry of transuranium elements developed intensively (A. P. Vinogradov, B. V. Kurchatov, Nikitin, Alimarin, and A. N. Murin). Methods have been developed for the isolation of radioactive isotopes of a number of elements from irradiated organoelemental compounds (Murin, V. D. Nefedov, and others).

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"Shchukarev in 1923 expressed for the first time the idea in regard to the periodicity inherent in the atomic nucleus and formulated rules for the stability of isobars that explain the possibility of the existence in central parts of the system of elements which do not have any stable isotopes.

"At present the layer structure of nuclei and the periodicity which follows from it and is responsible for the known anomalies of atomic weights and of other characteristics of nuclear systems are recognized by science together with the isobar rules which explain the instability of technetium and promethium."

16. USSR Developments in the Field of Radiochemistry and Radiation Chemistry

"Principal Trends in the Development of Soviet Chemical Science," by Academician I. L. Knunyants; Moscow, Khimicheskaya Nauka i Promyshlennost, Vol 2, No 5, Oct 57, pp 538-569

Radiochemical research expanded considerably during the past 10-15 years. Of particular importance are radiochemical investigations of nuclear transformation products which are formed on bombardment of different substances with high-energy particles.

Tracer atom methods are applied extensively in the USSR for the solution of technological problems as well as of purely scientific problems. One of the most important methods being applied in USSR radiochemical research is that of ion-exchange chromatography.

In addition to extensive work in the field of radiochemistry, the investigation of chemical processes induced by radiation emitted by radioactive substances is developing on an extensive scale; this branch of chemistry, known as radiation chemistry, has acquired particular significance during recent years in connection with the very rapid development of nuclear power engineering. It is known that the operation of nuclear reactors is accompanied by profuse emission of hard gamma radiation and the formation of radioactive isotopes. Under the circumstances, it is necessary to know what changes occur in different materials under the action of penetrating radiation, including that of the neutron flux. When plutonium is produced in connection with the operation of nuclear electric power plants, it is necessary to treat the uranium rods after they have been used in the nuclear reactor. This treatment begins after a prolonged storage of the rods with the view of reducing their radioactivity. It is obvious that during this storage huge quantities of energy are lost. This energy in the form of penetrating radiation could be utilized, for instance, for the purpose of conducting various chemical

reactions. Furthermore, radiation chemistry is of importance at present because of the necessity of investigating the biochemical effects exerted by penetrating radiation on living organisms. It is obvious that the action of hard radiation on the animal organism depends primarily on the chemical changes produced in the organism by the radiation. The attention which is paid to radiation chemistry in connection with the development of measures for the protection against penetrating radiation is well-known: here problems of protection against effects produced by nuclear energy are closely connected with questions that are to be answered by work in the field of radiation chemistry.

In connection with what has been said, the action on nuclear radiation on high polymers is of great interest. As far as research dealing with the action of radiation on aqueous solutions of inorganic salts is concerned, the mechanism of some redox reaction and of the formation of hydrogen peroxide salts in aqueous solutions has been clarified. An important fact which has been established is that a special effect is exerted by excited molecules of the solvent in radiolysis.

Of particular importance are investigations which have been conducted on the subject of the formation of ozone and oxidation of nitrogen on irradiation of liquid oxygen and liquid nitrogen-oxygen mixtures with gamma rays emitted by cobalt-60.

In connection with his work in the field of geochemistry, A. P. Vinogradov initiated radiochemical investigation of products of the fission and spallation of the nuclei of uranium, thorium, bismuth, copper, and other elements when it became possible to study nuclear processes by bombarding complex nuclei of elements with high-energy particles. In the work in question he investigated the formation of numerous radioactive isotopes and clarified the relationships pertaining to the fission and spallation of nuclei as affected by the energy of particles and their type. Vinogradov paid particular attention to the determination of the yields of rare-earth elements formed in the splitting of different nuclei. The work in question has a bearing on problems arising in connection with attempts to explain the origin of rare-earth elements in nature.

Neither the investigation of the chemical composition of living organisms, soils, and rocks in biogeochemistry, nor the investigation of the isotope composition of natural objects, nor the study of nuclear processes could be accomplished if extensive experimental work in analytical chemistry had not been done. During the past 40 years, a great amount of work has been done in the field of analytical chemistry in connection with the very rapid industrial expansion which took place during that period. Major discoveries were made and important investigations conducted in branches of chemistry which are characteristic for

the new trend of development in chemical science. Here, one must first of all mention the work by N. A. Tananayev, who developed at Kiev the novel method of capillary analysis. He shares the honor of initiating the method of capillary analysis with the Austrian scientist F. Feigl, who somewhat later made the same discovery independently.

Other major fields of original research are formed by the work of I. V. Tananayev and A. K. Babko, who investigated analytical reactions and analytical [separation] processes with the aid of physicochemical methods and also by the work in the field of analytical radiochemistry conducted under the direction of A. P. Vinogradov, I. P. Alimarin, and several other investigators. (pp 567-569)

### Industrial Chemistry

#### 17. Current Trends in the USSR Plastics Industry

"Problems of the Development of the Plastics Industry," by M. I. Garbar (chief engineer, Main Administration of the Plastics, Lacquer, and Paint Industry), Moscow, Khimicheskaya Promyshlennost', No 7, Oct-Nov 57, pp 397-402

[SIR Note: The article summarized below reviews recent USSR work in the field of plastics and indicates the lines along which the USSR plastics industry ought to develop in the near future. Research on heat-resistant plastics (including inorganic polymers) and the application of radiation chemistry in the synthesis of plastics are emphasized. The advantages of isotactic polymers from the standpoint of heat resistance and mechanical strength are set forth.]

The rate of expansion of the plastics industry in the USSR has been greater than that of the chemical industry as a whole. The volume of the production of plastics must be increased sharply at such a rate that the supply will continue to exceed the consumption in the industry, as has been the case heretofore. The discovery of organometallic catalysts makes it possible to produce polymers with new, particularly valuable characteristics (high mechanical strength, improved heat stability, and greater transparency and homogeneity) from monomers the industrial production of which has already been mastered (styrene, ethylene, propylene, butadiene, etc.)

As far as the production of crude materials for the plastics industry is concerned, petrochemical methods must be applied more widely. Acetylene should be produced from the methane of natural gas by electric cracking or partial oxidation. The combined production of ethylene and acetylene by the high-temperature pyrolysis of liquid and gaseous saturated hydrocarbons deserves increased attention, because it will furnish crude materials (acetylene and ethylene) for plastics such as polyethylene, polystyrene, and polyvinylacetate with higher yields and at a lower cost than the conversion of methane to acetylene combined with the production of synthesis gas. Chloro- and nitroderivatives of hydrocarbons should be utilized to an increased extent in processes for the production of crude materials to be used in the synthesis of plastics such as fluorocarbons, silicones, and polyamides. Products of telomerization syntheses ought to be applied more extensively as starting materials for plasticizers, plastics, and synthetic fibers.

Because of the low content (1.5-2.5%) of ethylene in coke gas, the recovery of this product pays only when the gas is utilized for the production of ammonia. The ethylene is then used for the production of ethylbenzene and of other derivatives. This procedure is followed at a number of USSR plants. The development of improved methods of absorption ("hypersorption") and of the enrichment of coke gas with ethylene to 8-12% by injection and burning of petroleum residues in coke ovens will create the necessary prerequisites for the organization of a production of organic chemicals and plastics on this basis.

To expedite advances in the field of fluorine plastics and of other fluorine derivatives, it will be advisable to develop as rapidly as possible methods for the production of fluorocarbons and freons on the basis of the gases containing fluorine that are obtained in large quantities at superphosphate plants and are not being utilized completely at present.

The scientific research institutes which work on plastics (e.g., the Scientific Research Institute of Polymerized Plastics [NIIPP] and the Scientific Research and Planning Institute of the Plastics Industry) have expanded their activities considerably during recent years and increased their personnel. To bring scientific research activities nearer to concentrations of industrial enterprises, reorganization of individual laboratories of the Scientific Research Institute of Plastics (NIIPM) into affiliates of the institute has been decided on. These affiliates will be located at Kemerovo, Nizhniy Tagil, Novosibirsk, and Sverdlovsk.

At the Physicochemical Institute imeni L. Ya. Karpov, research in the field of high polymers must be expanded, particularly as far as polymerization processes, colloidal chemistry, the synthesis and structure of organometallic compounds, and the radiation chemistry of polymers are

concerned. The radiation chemistry of polymers as well as extensive application of radiation in the chemical industry in general are particularly promising fields which will be expanded at an appropriately rapid rate. A technological foundation for this expansion is being laid by the organization of an affiliate of the Physicochemical Institute imeni L. Ya. Karpov.

Research work in the field of plastics must not be limited to organic compounds; with respect to this, NIIPM acted correctly in organizing a laboratory of inorganic polymers.

It will be expedient to organize a central institute of high polymers at the Academy of Sciences USSR. The organization of an institute of this type is imposed by the necessity of conducting basic research on the catalysis of the formation and synthesis of radically new high polymers possessing an exceptional mechanical strength and a high resistance to heat.

USSR scientists and engineers have attained important successes in the field of plastics during the past few years. As far as polyethylene is concerned, the chief drawback of high-pressure polyethylene, i.e., its low resistance to heat, can be partly overcome by gamma-irradiation or by the production of the so-called dense polyethylene with a specific gravity of 0.94-0.96 and a melting point of  $100^{\circ}$  in the same high-pressure equipment. Increases in the dimensions of equipment for the production of high-pressure ethylene and automatization of the production process make this process more advantageous from the economic point of view. Low-pressure polyethylene, although it is superior to high-pressure polyethylene in mechanical strength and heat resistance, cannot be produced at as low a cost at present, chiefly because the industrial process for its production has not yet reached an adequate stage of development. The low-pressure equipment can also be used for the polymerization of propylene or for producing ethylene-propylene copolymers.

Polypropylene is a very promising material for plastics and synthetic fibers because of its cheapness, ready availability of crude material for its production, and advantageous characteristics. Research on crystalline polymers (particularly crystalline polymers of propylene) must be expanded, because the synthesis of polymers with a regular crystalline structure (i.e., of isotactic polymers) is one of the principal methods for developing materials with the predetermined properties of great mechanical strength and superior heat resistance.

The production of polyethylene at medium pressures presents certain advantages. Because of the rapid development of nuclear technology, it may become economically feasible to initiate the polymerization of ethylene by means of gamma radiation.

Progress has been made in the field of block polymers and grafted polymers. Methods for the production of grafted polymers with the use of ultrasound and of penetrating radiation are being investigated.

A very promising method for the synthesis of block polymers is based on the chemical interaction between two or more polymers when a mixture of them is subjected to mechanical grinding. Prototype models of equipment for the production of block polymers and grafted polymers as well as of products made of them have been constructed at NIIPM.

New types of polymers and copolymers containing fluorine have been developed at the State Institute of Applied Chemistry and NIIPP.

Novel plastics have been developed on the basis of terephthalic esters and of diphenylolpropane esters of carbonic acid. Polycarbonate films, which have a crystalline structure, are distinguished by a high resistance to heat and an extraordinary mechanical strength.

Ion-exchange resins are being applied for many purposes, including the concentration of rare and nonferrous metals and the separation of isotopes. New heat-resistant ion-exchange resins and ion-exchange resin diaphragms for special applications have been developed.

Some of the tasks which must be accomplished by chemistry and the chemical industry in connection with the synthesis of polymers for plastics and the production of plastic products can be outlined as follows:

1. Development of phenol-formaldehyde resins of the novolac type with a longer straight chain length, so that a greater mechanical strength and higher resistance to heat will be achieved.
2. Synthesis of block polymers and grafted polymers on the basis of phenol-formaldehyde resins and rubber, polyvinylchloride, and other polymers.
3. The development of new types of amino-resins by utilizing melamine and combining these resins with resins of other types (organosilicon derivatives, etc.) and also organization of the industrial production of powdered amino-adhesives.
4. Development of new types of polyamides with an increased resistance to heat.

5. Research aiming at the development of new catalysts for polycondensation and polymerization processes.

6. Utilization of polymerized esters containing titanium, boron, phosphorus, and other elements to obtain organosilicon resins which exhibit an increased heat resistance.

7. Synthesis of new polymers derived from fluoroacrylic acids and other monomers.

8. Development of ion-exchange resins resistant to heat, radiation, and solvents and synthesis of selective ion-exchange resins.

9. Development of new methods of molding.

10. Initiation of the polymerization of monomers by nuclear radiation.

11. Development of more efficient methods for the production of olefins and acetylene and also of oxygen-containing compounds (acids, alcohols, and aldehydes) from petroleum raw materials and natural gas.

12. Designing of more efficient equipment for the production and molding of plastics.

13. Development of inorganic polymers with an increased mechanical strength, so that these polymers can be used as heat-resistant coating materials.

14. Development of new methods for the rapid analysis and testing of plastics.

15. Investigation of the aging of plastics and development of methods to slow down aging by the addition of stabilizers, etc.

16. Extensive application of ultrasound for the investigation of the mechanical properties of polymers, separation of polymer mixtures, polymerization and depolymerization of polymers, the preparation of dispersions and emulsions, etc.

17. Introduction of a rapid method for the acetylation of cellulose and of block polymers derived from cellulose ethers and nitrile rubber.

18. Development of heat-resistant materials on the basis of the following:

- a. Diphenylolpropane and phosgene derivatives.
- b. Terephthalic acid esters, diphenylolpropane, and para-xyleneglycol.
- c. Fluoroorganic compounds, perfluorobutadiene derivatives, etc.
- d. Organometallic and organoelemental compounds (silicon, titanium and boron derivatives, etc.)
- e. Polyparaxylylene and the polymerization of cycloolefins.
- f. Combination of polymers with heat-resistant fillers, inorganic polymers, and finely dispersed metals.

19. The development of fire-resistant resins containing phosphorus.

20. Production by more efficient methods and at lower cost of dicarboxylic acids (e.g., synthetic acids of the type of sebacic acid) and polymerized plasticizers.

21. Expansion of theoretical work on the catalysis, kinetics, and mechanism of polymerization and polycondensation processes as well as of work on the interdependence between structure and the properties of synthetic resins.

18. USSR Work on Ion-Exchange Resins

"High-Molecular Insoluble Polyelectrolytes (Ion-Exchange Resins)," by Ye. B. Trostyanskaya and A. B. Pashkov, Moscow, Khimicheskaya Nauka i Promyshlennost', Vol 2, No 5, Oct 57, pp 593-602

During recent years an extensive class of high-molecular compounds has been created which can be described as high-molecular insoluble polyelectrolytes. These compounds, known as ion-exchange resins, are being applied to an increasing extent for the purification of solutions of nonelectrolytes from electrolytes, the extraction of ions of valuable elements from dilute solutions (ion-exchange adsorption), and the separation of complex mixtures of electrolytes (ion-exchange chromatography). They are also applied as selectively acting conducting diaphragms (ionite diaphragms or membranes) in electrolytic processes, as catalysts in many organic synthetic processes, and as therapeutic agents.

### Synthesis of Insoluble Polyelectrolytes by Polycondensation

In the USSR cation-exchange resins that constitute products of the condensation of phenolsulfonic acid with phenol and formaldehyde are supplied under the trade marks MSF and KU-1. Outside the USSR resins of analogous constitution and having analogous properties are produced under the designations Wofatit P, Amberlite IR-100, Amberlite IR-105, Dowex-30, etc. The use of naphthalenesulfonic acid in the synthesis of ion-exchange resins has been proposed: it is used in the production of the resin KU-5.

It has been established that ion-exchange resins can be obtained by the polycondensation of monohydroxyphenylphosphate with formaldehyde (RF ion-exchange resin) and of hydroxyphenylenearsonic acid with phenol and formaldehyde (AF ion-exchange resin).

A. B. Davankov, G. S. Petrov, and V. M. Laufer succeeded in raising the basicity of polyphenylenediamine resins by copolymerizing them with guanidine. Anionites with basicities ranging from weak to medium are being applied extensively: they have been synthesized by condensing urea, melamine, thiourea or guanidine with formaldehyde (e.g. (e. g., ion-exchange resins MM, MMG, N-O, etc.) By the polycondensation of trimethylolmelamine in an acidic medium, USSR workers obtained the weakly basic resin AN-1. Pashkov, Vittikh (Wittich), and Samborskiy proposed that anionites be prepared by the condensation of polyethylene-polyamines with phenol and formaldehyde (AN-2 F). By selecting an inert medium and appropriate conditions of condensation, this ion-exchange resin could be obtained in the form of spherical granules (AN-2 FG). This resin belongs to the weakly basic anionites. Anionites of a similar composition are produced in the US by Roehm and Haas, who distribute them under the designation JR-4B.

High-quality anionites of medium basicity have been obtained by reacting polyethylenepolyamines with epichlorohydrin (e. g. EDE-10).

Although well-suited for some applications, ion-exchange resins obtained by condensation have a number of shortcomings: mixed polyelectrolytes of this type are not suitable for chromatographic investigations, condensed resins are not sufficiently stable to alkaline and oxidizing media and deteriorate readily under the effect of gamma-radiation, they contain impurities which get into the liquids being treated, etc. These considerations suggested the application of polymerization processes for the synthesis of ion-exchange resins.

### Synthesis of Insoluble Polyelectrolytes by Polymerization

Polymerized ion-exchange resins are prepared by two methods: by the copolymerization of substances containing ionogenic groups with some diolefin or by the introduction of ionogenic groups into the composition of an insoluble polymer with a network structure.

With the use of the first method various insoluble carboxylic acids were synthesized in the USSR which exhibit different permeabilities of the macromolecular network. Among the most common ion-exchange resins of this type are the copolymers KMT, KB-2, KB-4, KMD, KMG, KM, and KN. All of them have been obtained by the polymerization of acrylic or methacrylic acid with cross-link forming components such as divinylbenzene, glycol dimethacrylate, allyl maleinate, and butadiene.

Cationites obtained by the sulfonation of copolymers of styrene with various diolefins are known in the USSR under the designations SDV-3, SBS-1, SBS-3, SM-12, and KU-2.

Ion-exchange resins prepared in the form of diaphragms or films are being applied extensively in practice. Diaphragms of this type are made by mixing a finely powdered ion-exchange resin with some substance serving as a binder and then pressing or rolling the mixture. The production of small disks by pressing a mixture of a powdered ion-exchange resin (added in a quantity of 50-70%) together with polystyrene or polymethylmethacrylate has been described. However, such disks deteriorate rapidly because of the sharp difference between the coefficient of swelling of the ion-exchange resin and that of the polymer used as a binder. The method in question can be recommended only if ion-exchange resins that do not swell are used. Diaphragms and films which are stronger mechanically and stable in solutions with variable concentrations of hydrogen ions were obtained by rolling powdered ion-exchange resins with rubber or other elastomers (cf. Ye. B. Trostyanskaya, I. P. Losev, and A. S. Tevlina, Zhurnal Analiticheskoy Khimii, No 2, March-April 1957, p 66; and O. S. Lenchevskiy, Collection of articles Issledovaniya po Vodopodgotovke (Investigations on Water Treatment), Promstroyizdat, 1956). The high capacity of the resilient diaphragms obtained in this manner is combined with a low electric resistance (150-500 ohms x centimeters), a high selectivity, and a satisfactory mechanical strength. Diaphragms of this type are used as electrochemically active partitions.

### Applications of Ion-Exchange Resins

In the USSR treatment of feed water for high-pressure boilers is done in the following manner: elimination of metal cations by means of sulfonated coal (H-cationization), removal with the aid of a weakly basic anionite (e. g., AN-2F) of the strong acids that are formed, repeated H-cationization, and removal of the residual acidity with a strongly basic anionite (e. g., EDE-10 P). After this treatment the residual content of electrolytes does not exceed 0.1 milligrams per liter.

By using the selective properties of ion-exchange resins, one may separate complex mixtures of electrolytes or adsorb selectively a specific ion from solutions. This characteristic of ion-exchange resins is utilized extensively in processes of water softening, an application for which sulfonated coal or cationite KU-2 which have been converted into the corresponding sodium salts are used.

A method has been developed for the adsorption of nickel from solutions containing a considerable amount of sodium chloride. Sulfonated coal or ion-exchange resins of the KMT or KB-4 type, which contain carboxyl groups, are used for this purpose. The selective adsorption of gold ions from cyanide solutions by means of the NO and MMG anionites has been realized.

The selective properties of ion-exchange resins (particularly KU-2, SDV-3, SBS, and Dowex-50) in the separation of ions of rare-earth elements have been utilized to advantage. By using the cationites SDV and SBS, copper ions have been separated from iron ions, manganese separated from iron, and vanadium or molybdenum from iron. Ion-exchange resins are also used for the separation of niobium from titanium, molybdenum from rhenium, and rhenium from vanadium and tungsten.

Cationites of the RF type, which contain phosphoric acid residues, have been applied for the separation of alkali metals from each other and for the selective adsorption of uranium ions.

Many investigations indicated that it is possible to conduct ion-exchange adsorption processes in such solvents as acetone, alcohol, kerosene, gasoline, and glycerin. By using ion-exchange resins, one can eliminate electrolytes present as impurities in these solvents. It was established that there is a direct dependence between the capacity to exchange ions and the dielectric permittivity of the solvent.

Ion-exchange resins are used to an ever increasing extent in medicine. By the filtration of blood through the cation-exchange resins KU-2 or SDV-3, calcium ions are removed from it. The coagulation of the blood is prevented thereby, while at the same time the valuable properties of the blood are preserved during storage.

The development of ion-exchange diaphragms induced considerable interest in the possibilities of using them for practical applications such as elimination of electrolytes from solutions by electrolysis, concentration of ions, and separation of cations from anions. Experimental electrolysis installations equipped with ion-exchange diaphragms proved to be completely suitable for the conversion of sea water to fresh water, the softening of sea water, and also the elimination from sea water of products of radioactive decay. The efficiency of the new method is a result of the high selective permeability of the ion-exchange diaphragms to ions and the low electric resistance of these diaphragms. According to the data of T. Sherwood (The Technology Review, No 11, 1954,) the electrolysis method [electrodialysis method] of desalting sea water with the application of ion-exchange resin diaphragms is the cheapest at present.

The catalytic properties of ion-exchange resins are attracting increased attention. However, the application of ion exchangers as catalysts of organic syntheses is limited by the low heat stability of materials of this type: cation-exchange resins are unstable above 150-170° and anion-exchange resins above 100°.

19. Investigation of the Process of Formation of Acetylene by the Combustion of Methane

"Formation of Acetylene On Incomplete Combustion of Methane in Oxygen," by Z. V. Iyevleva and P. A. Tesner, All-Union Scientific Research Institute of Natural Gases, Doklady Akademii Nauk SSSR, Vol 115, No 3, 21 Jul 57, pp 537-540

The oxidative conversion of methane to acetylene by combustion of the latter in oxygen in a type of flame resembling that of a Bunsen burner was investigated. Experiments were conducted with an open and divided flame at different ratios of methane to oxygen and also with the addition of propane to the methane. The curves of the acetylene content were determined at 11 different horizontal cross sections of the flame for different distances from the edge of the burner. The concentration gradients of the different constituents of the reaction mixture were measured along the vertical axis of the flame. It was found that in the beginning of the oxygen zone formation of carbon monoxide and water

proceeds with the greatest velocity: formation of acetylene reaches a significant velocity only at the end of the oxygen zone and is accompanied by the formation of hydrogen at an increased rate. This result conflicts with the mechanism proposed by P. Benedek and A. Laslo (cf. Magyar Kemiai Folyoirat, Vol 57, 1951, p 372), according to whom acetylene is formed by the interaction of formaldehyde with methyl alcohol.

Apparently, the formation of acetylene, which is accompanied by the formation of hydrogen proceeds by a purely thermal mechanism: methane molecules or hydrocarbon radicals interact after a sufficiently high temperature has been reached as a result of the combustion of a part of the methane to CO, H<sub>2</sub>O, and CO<sub>2</sub>. Hydrogen at the end of the oxygen zone is also formed by the reaction



However, the concentration of CO<sub>2</sub> in the combustion products is somewhat lower than the concentration of hydrogen, so that this reaction cannot be regarded as responsible for the formation of all the hydrogen that is obtained.

When propane has been added to the methane, the concentration of acetylene in the combustion products and the yield of acetylene increase.

20. Soviet Isotopes Supplied by "Soyuzreaktiv"

(Advertisement), Moscow, Pribory i Tekhnika Eksperimenta, No 6, Nov/Dec 57, back cover

The "Soyuzreaktiv" Trust of the Ministry of Chemical Industry supplies all branches of the economy with radiation sources and articles and compounds containing radioactive and enriched stable isotopes. The following 57 isotopes are listed for sale:

Tritium-3; carbon-14; sodium-22 and 24; silicon-31; phosphorus-32; sulfur-35; chlorine-36, potassium-42; calcium-45; chrom-51; manganese-52 and 54; iron-55 and 59; cobalt-57, 58 and 60; nickel-59 and 63; copper-64; zinc-65; germanium-71; gallium-72; arsenic-73, 74, and 76; selenium-75; bromine-82; rubidium-86; strontium-89, 90; yttrium-90 and 91; niobium-95; zirconium-95; molybdenum-99; ruthenium-103 and 106; silver-110; indium-114;

cadmium-115; tin-113 and 123; antimony-124; tellurium-127; iodine-131; cesium-134 and 137; barium-140; lanthanum-140; cerium-141 and 144; praseodymium-143; neodymium-147; promethium-147; europium-152, 154, and 155; holmium-166; erbium-169; ytterbium-175; lutecium-177; hafnium-181; tantalum-182; tungsten-185; rhenium-186; osmium-191; iridium-192; platinum-197; gold-198; mercury-203; and thallium-204.

Information concerning the supply of the above preparations may be obtained by mail at the following address: Moskva, Tsentr, Krivokolenny pereulok 12, telephone K-4-56-43.

[For additional information on industrial chemistry, see Items No 13, 41, and 42.]

Safety Engineering. Sanitation

21. Personnel Protection in Granozan Production

"Labor Hygiene in Granozan Production," by V. S. Russkikh and A. Ya. Tubina, Materialy po Voprosam Gigiyeny Truda i Kliniki Professional'nykh Bolezney (Material on Questions of Labor Hygiene and Clinics of Occupational Diseases), (from Meditinskiy Referativnyy Zhurnal, No 10, Oct 57, pp 31)

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"Granozan, or NIUIF-2, is a 2% mixture of ethylmercuric chloride and talc. Similar to other organic compounds of mercury, it causes toxic encephalopathy quicker than metallic mercury. Granozan production workers examined at the clinic of the Gor'ky Institute of Labor Hygiene, were found to have changes in the central nervous system manifested in vegetative dystonia and disruption of secretory functions of the stomach, the disintoxicating capacity of the liver, and others. The article describes the production process of granozan and outlines correct sanitary procedures. In studying the atmosphere in the granozan production plant, a separation method for determining metallic mercury and its organic compounds devised by one of the authors of the article (A. Ya. Tubina) was used. It is based on the solubility differences of mercuric chloride vapors, metallic mercury, and its organic compounds in absorbing solutions at different rates of air passage. The method of determination is described. Investigation of working atmospheres revealed that

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in many places the content of toxic substances was considerably greater than the maximum permissible concentration. Reasons for the increased content of mercury in the air are discussed together with a method for demercurizing floors, walls, and equipment with soap-soda solutions; a method of decontaminating special clothing and other sanitation measures are listed."

22. Insecticide Spraying Equipment

"The Protection of Landscape Plantings," by A. N. Volkov, chief of the Moskovskaya Oblast Station for the Protection of Landscape Plantings; Moscow, Zashchita Rasteniy, No 1, Jan-Feb 58, pp 14-17

The article describes in general the various insecticides and spraying equipment used by the Moscow Station for the Protection of Landscape Plantings.

The equipment at the station consists of the following apparatuses: 14 horse-drawn motor-operated OMP-A (Pioneer) sprayers; 10 OKS combination dusters and sprayers; 30 SP-4 apparatuses, operated by compressed air; 14 AG-L6 aerosol generators; 300 ORP pack sprayers; 125 ORM pack dusters; and 25 trucks and light automobiles.

Miscellaneous

23. Western Research on Insecticides Translated Into Russian

"Chemical Means of Plant Protection" (unsigned article); Moscow, Zashchita Rasteniy ot Vreditel'ey i Bolezney, No 5, Sep/Oct 57, p 63

The periodical Khimicheskiye Sredstva Zashchity Rasteniy has been in publication for the last 3-4 years and is released in the "sbornik" form. Its contents consist of translations of articles from foreign sources on the application, production, chemistry, toxicology, analysis, and mechanism of action of new preparations for the protection of plants from diseases and pests. A new division of the periodical, "New Preparations," carries information on the release of new insecticides and new methods of application by foreign firms.

24. Soviet-Afghan Conference on Plant Protection

"Fourteenth Soviet-Afghan Conference"; Moscow, Zashchita Rasteniy, No 1, Jan-Feb 58, p 57

In October 1957 the 14th conference concerning the locust and cotton pest problem was held in Moscow between the Soviet Union and Afghanistan. The Afghan delegation included Mukhamed Karim Ziyai, chief of the Directorate of Agricultural Pest Control, Ministry of Agriculture (chief of the delegation); Mesdzhedi, chief of a department of the directorate; and Abdula, chief of the Laboratory for the Protection of Plants. The Soviet delegation was headed by Ye. N. Ivanov, chief of the Main State Administration for the Quarantine and Protection of Plants, Ministry of Agriculture USSR, and included D. D. Goloviznin, a senior agronomist of the Administration; A. M. Zemenko, chief agronomist of the Administration for the Protection of Plants in the Uzbek SSR; and Ye. N. Kozlova, a scientist from VIZR (All-Union Institute for Protection of Plants).

In addition to conferences on locusts and cotton pest control of interest to both countries, the Soviet delegation presented papers on new poisons used to control cotton pests and diseases -- mercaptophos, copper trichlorophenylate, -methasystox, and M-81. The latter two compounds, are now in the testing phase.

After the conference, the Afghan delegation visited the facilities of the quarantine inspectorate in Tashkent, Sochi, and Baku. While in Baku, the members visited and inspected a vacuum fumigation chamber.

25. Birthday of Czechoslovak Scientist

"Academician Vitezslav Vesely Lives To Be 80" (unsigned article), Prague, Prace, 29 Dec 57, p 3

On 29 December Academician Vitezslav Vesely, chief representative of Czechoslovak classical organic chemistry, was 80 years old. He is especially famous for renovating and perfecting the chemical institute at the Brno Technical School.

26. Death of Plastics Specialist

"Personalities" (unsigned article), Berlin, Technische Gemeinschaft, No 12, Dec 57, p 573

Kurt Albrecht, engineer and manager of the Plastics Department in the Bitterfeld Electrochemical Combine, died recently at the age of 55. At the time of his death Albrecht was working on the development of durable plastics (Duroplaste) and thermoplastics.

### III. ELECTRONICS

#### Communications

27. Soviet Electronics Exhibits at the Brussels Fair

"The World's Fair," by M. Likhachev and A. Shokin; Moscow, Radio, No 1, Jan 58, pp 28-30

Three consecutive days in August 1958 will be assigned to the USSR's "Day of the Nation" during the Brussels Fair.

The radio engineering industry is preparing a large and complex exhibit of television and radio broadcasting equipment. The central 12-channel TV installation at the Soviet pavilion will be designed by the TV Institute and will be of the highest standard.

Another attraction of the Soviet pavilion will be an underwater TV camera enclosed in a bathysphere.

CPYRGHT Commercial TV installations for the control of industrial processes will be displayed. More than 20 TV receiver models will be exhibited.

"The discovery by the Soviet people of the epoch of intercontinental rocket technique will be displayed."

28. Soviet VHF and UHF Radio Amateurs' Plans for 1958

"Make USW Radio Sports Widespread," by V. Lykov; Moscow, Radio, No 1, Jan 58, pp 21-22

The article concludes with the following statements:  
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"The year 1958 should be the year of new achievements in the field of further development of the USW [VHF and UHF] communications, and, in particular, the mastering of such frequencies as 144-146, 420-425, and 1,470-1,520 Mc. It is necessary to transform USW sports into a genuine mass movement among the radio amateurs. Soviet ultrashort-wave operators can and should be the strongest."

29. East German Telephone Selectors

"Movements in Selectors for Telephone Engineering," by K. Thielecke; Berlin, Nachrichtentechnik, No 10, Oct 57, pp 448-454

Tests conducted with oscilloscope and motion-picture camera show that modern telephone installations require selectors with a higher operational speed than that of the RFT motor selector 53. About 300 steps per second will be required, whereas the motor selector 53 has a maximum operation speed of 160-180 steps per second. A rapid-action testing relay must also be developed in order that faster-acting selectors can be controlled.

Components

30. Miniature Synchro Motors for Aircraft Application

(Advertisement), Pribery i Tekhnika Eksperimenta, No 6, Nov/Dec 57, (second page of advertisements in the back of the journal)

Synchronous hysteresis miniature motors of the GChN type are intended for driving mechanisms at a strictly constant speed of rotation.

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The motors are designed both for ground operation and for airborne operation. The motors are enclosed without ventilation and have mounting flanges. The motors are self-starting with full torque at the shaft.

Principal Technical Characteristics

Type of motor	GChN-021/8	GChN-022/8	GChN-031/8
No of phases	3	3	3
Frequency, in cps	500	500	500
Voltage supply, in volts	40	40	40
Power at shaft, in watts	5	5	5
Speed of rotation, in rpm	7,500	7,500	7,500
Input current, in amperes	1	1.7	2.1
Weight, in grams	300	500	550

Orders for these motors are to be addressed to the following: Mos - kva, 46, Pervyy D'yakovskiy pereulok, dom 4, Glavelektrosbyt.

31. New Soviet "Druzhba" Radio Receiver

"Radio-Phonograph and Radio Receivers" (unsigned article),  
Moscow, Novyye Tovary, No 8, Aug 57, p 17

The "Druzhba" radio-phonograph combination is an 11-tube superheterodyne set designed for the reception of programs on the long-, medium-, short-, and ultrashort (FM)-wave ranges. The power consumption is 100 w and the rated power output is 4 w, with the maximum output at 10 w. Four oval speakers are incorporated in the set. The price of the radio-phonograph combination is 2,300 rubles.

32. New Soviet "Muromets" Radio Receiver

"Muromets," by M. Ganzburg, Moscow, Novyye Tovary, No 8,  
Aug 57, p 16

The new "Muromets" seven-tube radio-phonograph combination is now ready for production. This will be a third-class receiver designed for the reception of programs in the long-, medium-, short-, and ultrashort (FM)-wave ranges. The power input to the set is 55 w and the output is 2 w. The set will have two 1GD-5 loud-speakers. The over-all dimension of the cabinet will be 530 X 380 X 345 mm. The radio-phonograph combination will sell for 1,150 rubles and the radio receiver alone for 750 rubles.

33. New Soviet "Volna" Radio Receiver

"'Volna' Radio Receiver," by M. Ganzburg; Moscow, Novyye Tovary, No 9, Sep 57, p 6

One of the radio plants has readied its assembly lines for the production of the new "Volna" radio receiver. This superheterodyne set is built with three miniature tubes and is designed for the reception of long- and medium-wave programs. The electric and acoustic parameters of the "Volga" will excel those of the formerly manufactured "Moskvich" and "ARZ" sets. The output power of the receiver is 0.5 va, and with a small indoor antenna the set can receive programs from many stations. The set utilizes semiconductor devices for detection and rectification. The weight of the set will be 5 kg.

34. Semiconductor Converter-Transformer

"Semiconductor Converter for DC Current," by G. S. Tsykin;  
Moscow, Radiotekhnika, No 12, Dec 57, pp 56-66

The article describes the construction and performance of a new type of converter which changes the voltage of a dc current. The power output of such a converter is sufficiently high to operate a number of pieces of electronic equipment.

The converter comprises a square-pulse oscillator which actuates a transistorized power amplifying unit. The amplified square pulse is rectified by a semiconductor rectifier and is fed through a smoothing filter to the load. The power supply to the master oscillator undergoes the desired voltage transformation. The separation of such functions as pulse generation, their amplification, and their rectification permits the elimination of some drawbacks inherent in conventional units; it also increases the transistor power output and improves the transformation efficiency (up to 95%). The power amplifier has two transistors operating in a push-pull circuit with either their bases, emitters, or collectors connected in common.

One experimental circuit with two P-3V transistors transformed a 22 v power supply to 250 v with a power output of 20 w, thus showing an efficiency of about 92%.

35. Permanent Flash Bulbs

"Pulse Lamps," by I. Marshak; Moscow, Radio, No 1, Jan 58,  
pp 53-55

Modern permanent flash bulbs are built of a glass or quartz envelope filled with heavy inert xenon gas. The following tubes are now manufactured in the USSR:

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<u>Tube Designation</u>	<u>Energy of Flash in Joules</u>	<u>Light Output in Lumen/Sec</u>	<u>Duration of Flash in Microsec</u>	<u>Tube Life 1,000 Flashes</u>
IFK-20	20	200	0.2	10
IFK-50	50	700	0.4	10
IFK-120	120	2,500	1.2	10
IFK-500	500	10,000	8.0	10

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<u>Tube Designation</u>	<u>Energy of Flash in Joules</u>	<u>Light Output in Lumen/Sec</u>	<u>Duration of Flash in Microsec</u>	<u>Tube Life 1,000 Flashes</u>
IFK-2,000	2,000	60,000	4.0	5
IFB-300	300	5,000	8.0	10
IFP-200	200	3,500	0.4	3
IFP-500	500	12,000	1.3	3
IFP-1,500	1,500	35,000	2.6	3
IFP-4,000	4,000	120,000	12.0	3
IFP-15,000	15,000	500,000	4.5	10

36. Prizes Awarded at the 14th All-Union Radio Exhibit

"Prizes to the Participants in the 14th All-Union Radio Exhibit" (unsigned article); Moscow, Radio, No 1, Jan 58, p 34

For the design of equipment suitable to industrial application, the first prize was awarded to V. V. Kol'tsov for a high-speed cathode-ray tube spectrometer. In the telemechanics section second prize was awarded to A. M. Nefedov and B. G. Dem'yanovskiy; in the radio receiver section, second prize to L. R. Putse; in the short-wave device section, second prize to V. A. Lomanovich; in the ultrashort-wave device section, first prize to B. N. Yelizarov; in the measuring instrument section, first prize to S. I. Sher; in the educational device section, first prize to S. I. Berman, S. A. Roze, Yu. S. Karp, and V. A. Selga, in the power supply and radio component section, second prize to N. I. Rodin; in the TV section, first prize to K. I. Samoylikov; in the sound recording section, first prize to G. G. Khovanskiy; in the amplifying device section, first prize to L. R. Putse; in the wire broadcasting section, third prize to G. Kh. Eessaar and E. A. Shul'ts; and, in the section for the workers of the radio industry, first prize to B. G. Khimichenko.

37. Electronic Components Combine in North China

"Industrial Combine for Components in North China," by  
-ep; Berlin, Radio und Fernsehen, No 24, Dec 57, pp 754-  
757

On 5 October 1957 a large combine for the manufacture of components for communications and high-frequency engineering was turned over to the Chinese by the East Germans who planned, equipped, and supervised the construction of the project designated "Project DDC." The combine is about 7 kilometers from Peiping, covers one square kilometer of ground, comprises 21 structural groups with 74 individual structures, and employs about 8,000 people.

The production operations are divided into three departments: (1) fine work, in which electrical testing instruments, variable capacitors, loud-speakers, microphones, current transformers, pressed plastic parts, etc., are manufactured; (2) components manufacture, involving capacitors, fixed and variable resistors, and selenium rectifiers; and (3) ceramics, in which ceramic capacitors, ceramic components for high-frequency equipment, high-frequency iron components, and magnetic components are produced; adjoining the ceramics area are the sintering, foundry and metal powder facilities.

The article includes a photograph of the site and photographs of various machines in operation.

Instruments and Equipment

38. Soviet High-Speed Cameras up to 2,500,000 Frames per Sec

"High-Speed Cameras With Rotating Mirrors," by I. Chernyy,  
Optiko-Mekhanicheskaya Promyshlennost', No 3, Mar 57, pp 18-  
20 [(abstract from Tekhnika Kino i Televideniya, No 12,  
Dec 57, p 79)]

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"The essence of the report delivered at the Third International Congress on High-Speed Photography is given.

"It is said that in the USSR there are manufactured and widely used cameras with intermittent movement of a 35-mm film, which are capable of taking up to 120 frames per sec, as well as optically compensated devices with continuous movement of a narrow film (16 or 2 X 8 mm) taking pictures at a rate up to 9,000 frames per sec. Besides, high-speed cameras with photographing speed up to 100,000 and 2,500,000 frames per sec are manufactured.

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"The high-speed SFR cameras used for recording fast processes, such as electric discharges, formation and propagation of shock waves, and fast combustion, are described."

Computers and Automation

39. Relays in the Zeiss Oprema Computer

"The Relay Techniques in the Oprema Computer of VEB Carl Zeiss Jena," by W. Kaemmerer; Berlin, Feinger-aetetechnik, No 1, Jan 58, pp 13-20

The article discusses the polarized relay with two positions of stability (type 0373, 3 coils with 5,400 windings each, 1,200 ohm, 6v/5ma, 3-5 seconds switching time), which has held up well in the Oprema computer during 2 years of operation in three shifts. The Oprema has 16,626 relays.

A description is given of the role played by the relay in the storage of information, in three-phase pulse operation, in relay chains, in the operation of manual interrupter switches, and in the operation of two different pulse systems with different frequencies in the same computer installation.

Acoustics and Audio Frequency

40. Miniature Ultrasonic Detector

"Miniature Piezoelectric Ultrasonic Receivers," by Ye. V. Romanenko, Acoustics Institute, Academy of Sciences USSR; Moscow, Akusticheskiy Zhurnal, No 4, Oct-Dec 57, pp 342-347

The construction, technology of fabrication, and methods of calibration of a miniature piezoelectric detector with barium titanate sensing element are described. The sensing element is executed in the form of a spherical layer of ceramic barium titanate of about 0.05 mm thickness deposited on a platinum ball beaded at the end of a 0.05 mm diameter wire. The ball serves as an interior electrode and the wire as the lead. The wire passes inside of a capillary glass tube which serves as a holder and a coaxial output. A layer of silver was deposited on the outer surface of the glass tube.

The specific feature of this device is that the piezoelement is fused directly to the interior electrode. Platinum was selected for the interior electrode because of its ability to withstand the fusing temperature of barium titanate (1,300°C).

The size of the sensing element is about 0.2 mm. The nonuniformity of the frequency characteristics is about 30% for the frequency range of 1-10 Mc. The sensitivity is about 0.004 to 0.007 microvolt/bar.

The directivity pattern is omnidirectional in the plane perpendicular to the axis of the detector holder.

Magnetic, Dielectric, and Semiconductor Materials

41. Sulfide Ores and Coal as a Source of Semiconductor Materials

Geologiya i Poleznyye Iskopayemye Urala (The Geology and Useful Minerals of the Urals), by Prof. A. A. Malakhov, Doctor of Geological-Mineralogical Sciences; Izdatel'stvo Znaniiye, Moscow, 1957, 30 pp

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"Some semiconductor materials are contained in sulfide ores. This is an entirely new problem. Not only sulfide ores serve as a source for semiconductor raw materials. Very rare elements, i.e., semiconductor materials that occur in nature in a dispersed state, are also contained in coal, lignite, and other minerals."

[SIR Note: This statement is made in a section of the booklet entitled "Ural Copper and Useful Minerals Related to It." Reference is apparently made to selenium and tellurium contained in pyrites, cadmium contained in zinc sulfide ores, and germanium contained in coal.]

42. Germanium and Gallium From Coal

"Ways of the Efficient Utilization of 'Fuses' ['Fusses'] of Coke-Chemical Plants," by I. K. Pyatunin and Ye. P. Babin, Ural Affiliate of the Academy of Sciences USSR; Novosibirsk, Izvestiya Vostochnykh Filialov Akademii Nauk SSSR, No 11, Nov 57, pp 97-102

'Fuses' ["fusses"] are a by-product of coke-chemical plants which consists of a thick, viscous, tarry mass containing coal dust. Methods have been studied to facilitate the handling, transportation, and utilization of this by-product by combining it with a filler such as calcium oxide or powdered coke so that forming into briquettes will be possible.

The by-product was found to have satisfactory properties from the standpoint of its application as a binder in the forming of briquettes or as a carbon additive in metallurgical reduction processes. In view of the fact that the by-product contains germanium and gallium, its conversion in combination with the smelting of polymetallic ores is advisable on the basis of a procedure developed with the participation of I. K. Pyatunin at the Laboratory of Rare Elements, Ural Affiliate of the Academy of Sciences USSR. By using this by-product as a reducing agent and binder in the complete pyrometallurgical conversion of dusts, sulfide concentrates, and ores of nonferrous metals, it will thus be possible to obtain an additional quantity of valuable rare metals.

#### IV. ENGINEERING

##### 43. Soviet Hydraulic Press for Molding Plastic Materials

"Hydraulic Press Model P 702 for Molding Porous Plastics,"  
by A. L. Ayzenshtok; Moscow, Byulleten' Tekhniko-  
Ekonomicheskoy Informatsii, No 1, Jan 57, pp 35-36

The Central Bureau for Forge and Press Machine Building of the Ministry of Machine Tool and Tool Industry has designed a hydraulic press model P/02 for molding porous plastic materials. The press was built by the "Tyazhstankogidropress" plant Imeni A. I. Efremova in Novosibirsk.

A photograph showing the general appearance of the press is given in the article, as well as a brief description of its construction and operation.

The four-column press develops a maximum pressure of 2,400 tons. In the lower stationary transverse member are located two reverse-stroke and two forward-stroke cylinders. The press is operated from a pump storage station with an operating fluid pressure of 200 kg/sq cm.

CPYRGHT The following technical characteristics of the press are given.

Total pressure	2,400 tons
Reverse stroke pressure	235 tons
Lift pressure	90 tons
Maximum distance between upper and movable transverse members	2,120 mm
Travel distance of moving trans- verse member	1,200 mm
Working area of heating plates	2,400 x 1,400 mm
Working pressure of fluid	200 kg/sq cm
Plan dimensions	3,880 x 2,140 mm
Height above floor level	3,900 mm
Depth below floor level	4,200 mm
Weight	140 tons

44. Absence of Self-Oscillations in Nonlinear Automatic Control System

"On the Investigation of Self Oscillations and Stability of Automatic Systems With Nonsymmetrical Nonlinearity in the Presence of an External Influence," by M. N. Starikova; Moscow, Izvestiya Akademii Nauk SSSR, Otdeleniye Tekhnicheskikh Nauk, No 9, Sep 57, pp 27-32

A nonlinear system of automatic control is investigated by the lag method suggested by Ye. P. Popov which is based on the principle of harmonic balance. The purpose of the work was to determine the effect of parameters of a system and the slowly changing disturbing influence on the amplitude and frequency of self-oscillations, to select parameters which ensure a lack of self-oscillations and a stable condition of equilibrium. The work in which satisfactory results were obtained was completed under the direction of B. N. Petrov.

45. Soviet Continuous Rolling Mill for Production of Aluminum Wire Rod

"Continuous Rolling Mill 250 for the Production of Aluminum Wire Rod," by P. I. Tetel'baum; Moscow, Byulleten' Tekhniko-Ekonomicheskoy Informatsii, No 1, Jan 57, pp 22-23

The Novo-Kramatorsk plant in Elektrostal has designed a high-capacity rolling mill for the production of aluminum wire rod, used as a semifinished product in the manufacture of aluminum wire. A sketch and a description of the operation of this rolling mill are given in the article.

The mill rolls 100 x 100 mm aluminum billets heated in an electric furnace and continuously rolled in 16 stands. The roughing group consists of 12 stands and the finishing group consists of 2 lines of 4 stands each. The mill rolls 7, 9, and 11 mm wire rod. The finished rod is wound into 600-meter bundles. The rolling speed is 15 m/sec. Tests will be made to increase this speed up to 25 m/sec.

The operation of the mill is fully mechanized and automatized. Photoelectric cells are used for automatic controls.

In the finishing group, the horizontal and vertical rolling stands are alternating. The peculiarities of the finishing stands (roll diameter 250 mm) are that they are directly driven by an electric motor. In the first rolling stands where the speed is rather low, water-lubricated textile bearings are used. Lubrication of the mill is centralized.

# V. MATHEMATICS

## 46. Mathematical Analysis

"Remark Concerning a Method of Finding Periodic Solutions," by Yu. S. Bogdanov. Leningrad; Moscow, Prikladnaya Matematika i Mekhanika, Vol 21, No 5, Sep/Oct 57, p 714

One of the methods of finding periodic solutions of differential systems consists in the analysis of their perturbations. (N. P. Yerugin, PMM, Vol 20, No 6, pp 659-670, 1952). As perturbations, systems having a periodic solution are chosen. If the succession of corresponding periodic solutions converges toward a certain periodic vector-function, the latter will be a solution of the specified system. It is demonstrated that if the initial system has a periodic solution, a succession of perturbation systems always exists.

## 47. Motion Stability Criteria

"Remark on Some Works Concerned With Linear Differential Systems With Periodic Coefficients," by V. A. Yakubovich, Leningrad; Moscow, Prikladnaya Matematika i Mekhanika, Vol 21, No 5, Sep/Oct 57, pp 707-713

The remark concerns analysis of stability criteria by L. Cesari, J. K. Hale, and R. A. Gambill (Rivista Mat. Univ. Parma, Vol 5, No 1-3, pp 55-60; 137-167; 169-181 [1954]). The analyzed equation is of the type:  $d^2y/dt^2 + [C + \lambda P(t)]y = 0$ , where  $y$  is a  $k$ -dimensional vector,  $C$  is a diagonal matrix with real and different diagonal elements  $\omega_1^2, \dots, \omega_k^2$ ,  $P(t)$  is a matrix of real periodical functions with a period  $T = 2\pi/\omega$ , integrated according to Lebesgue in an interval  $[0, T]$ . The basic result of the above-mentioned analysis is the theorem: If the numbers  $\omega_j > 0$  satisfy the inequalities

$$\omega_j + \omega_n \neq 0 \quad (m = 0, 1, 2, \dots)$$

and one of the relations  $P(t) = P^*(t)$  ( $P^*(t)$  is a translated matrix) or  $P(-t) = P(t)$  holds, then at sufficiently small  $\lambda$  all solutions of the system are bounded  $(-\infty, \infty)$ . Yakubovich indicates that this theorem is demonstrated by the above writers in a cumbersome way, while really it is a derivation from A. M. Lyapunov's work (Obshchaya Zadacha ob Ustoychivosti Dvizheniya, [General Problem of Stability of Motion], 1935). This point is demonstrated by the writer, noting that Cesari and others knew of Lyapunov's work inasmuch as they made references to it.

48. Czechoslovak Academician Is 60 Years Old

"The 60th Birthday of Academician Vojtech Jarnik"  
(unsigned article), Prague, Mlada Fronta, 22 Dec 57, p 7

Academician Vojtech Jarnik, professor of mathematics in Charles University in Prague, was 60 years old on 22 December 1957. The chief field of this scholar, recognized by the whole scientific world, is the analytical theory of numbers, in which he has won renown.

VI. MEDICINE

Bacteriology

49. Antibiotic-Resistant Dysentery Bacteria

"Data Concerning the Resistance of Dysentery Bacteria to Antibiotics," by T. S. Fedorova and L. A. Parshina, Tr. Tomskogo N.-I In-ta Vaktsin i Syvorotok (Works of the Tomsk Institute of Vaccines and Sera), No 8, 1956, pp 324-331 (from Referativnyy Zhurnal -- Biologiya, No 18, 25 Sep 57, Abstract No 77337, by T. P. Vertogradova)

CPYRGHT

"The resistance of different strains of Flexner dysentery bacteria to sanazin (I) and the combined action of I with synthomycin (II) and levomycetin (III) on bacteria were studied. After passage of the bacteria on media containing increasing amounts of antibiotics, resistance to II increased to 2-4 times, and to I, to 5-6 times what it had been. Strains resistant to I had prospective resistance to II and III. Reinforcement of this action was not observed following the combined use of I with II or III in vitro."

50. Experimental Research on Dysentery

"Yolk-Citrate-Rosolic Medium for Culturing Microorganisms of the Dysentery and Typho-Paratyphoid Groups," by S. F. Bubes, Uch. Zap. Dagestansk. N.-I. In-t po Proiz-vy Pitatel'nykh Sred (Scientific Notes of the Dagestan Institute for the Production of Culture Media), 1956, No 2, pp 69-75 (from Referativnyy Zhurnal -- Biologiya, No 17, 10 Sep 57, Abstract No 73121, by Yu. G. Taleyeva)

CPYRGHT

"A new yolk-citrate-rosolic medium is proposed. Pathogenic microorganisms will grow on it in the form of rich, colorless, S-shaped colonies; enterococci and coccic flora will not grow, Proteus will not clump, and Proteus colonies are large, bluish, and flat; colonies of intestinal bacilli are cloudy and red, with orange centers. Growth of intestinal bacilli is suppressed to a considerable extent. The medium permits the growth of an insignificant amount of dysentery and typho-paratyphoid microorganisms. Dysentery bacteria were cultured only 12.8% less frequently on the aforementioned medium than on Ploskirey's bactoagar."

"Therapeutic Resistance of Local Dysentery Strains," by S. F. Bubes, Uch. Zap. Dagestansk. N.-I. In-t po Proiz-vy Pitatel'n. Sred (Scientific Notes of the Dagestan Scientific Research Institute for the Production of Culture Media), No 2, 1956, pp 101-105 (from Referativnyy Zhurnal -- Biologiya, No 17, 10 Sep 57, Abstract No 73126, by M. Ya. Boyarskaya)

CPYRGHT

"The relationship of dysentery strains isolated to norsulfazol, synthomycin, and gramicidin C were studied. Dysentery bacteria showed the greatest sensitivity to gramicidin. Museum strains of dysentery bacteria had high sensitivity to all the preparations studied. The Flexner bacilli group, which constituted 90-95% of the dysentery pathogens isolated, was of greatest interest. Its basic types W and V did not differ in their relationships to the therapeutic preparations, but the group as a whole had a high percentage of resistant strains. The resistance of local dysentery strains to the therapeutic preparations was not constant, but increased with time."

"Microbiological Characteristics of So-Called 'Winter' Dysentery," by S. F. Bubes, Uch. Zap. Dagestansk. N.-I. In-t po Proiz-vy Pitatel'n. Sred. (Scientific Notes of the Dagestan Scientific Research Institute for the Production of Culture Media), No 2, 1956, pp 85-89 (from Referativnyy Zhurnal -- Biologiya, No 17, 10 Sep 57, Abstract No 73128, by Yu. F. Talayeva)

CPYRGHT

"Pathogens of dysentery infections were studied in the summer and winter periods from January 1951 to June 1952. Flexner dysentery bacilli are the basic species of pathogen of these diseases. In the winter, strains isolated during chronic diseases predominated (73.1%), and in the summer they constituted only approximately 11.4%. Cultures of Flexner bacillus isolated in the chronic form of dysentery did not differ according to phagolysability, cultural, biochemical, or serological characteristics from cultures isolated in the acute form of infection. A change in the serological type of Flexner's bacillus during the course of the disease was observed in the winter in 72.7% of the cases and was reported very frequently in chronic dysentery patients."

Epidemiology

51. Antibodies Against Tick-Borne Encephalitis Virus in Blood of Wild Birds

"The Observation of Neutralizing Antibodies Against Tick-Borne Encephalitis Virus in the Blood of Wild Birds," by Yu. V. Fedorov, Tomsk Scientific Research Institute of Vaccines and Sera; Moscow, Voprosy Virusologii, Vol 2, No 6, Nov/Dec 57, pp 336-338

In undertaking to study the role of wild birds as reservoirs of tick-borne encephalitis virus in the Tomsk focus, the authors examined the blood serum of the birds for virus-neutralizing antibodies and performed virological investigations of their brains and blood. Nine species of birds were involved. Results of these investigations, described in detail in the article, are presented in two tables. Conclusions drawn from these results are as follows:

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"1. Blood serum can be examined for the presence of virus-neutralizing antibodies to demonstrate the role of birds as reservoirs of tick-borne encephalitis virus in natural foci.

"2. Blood serum can be preserved in a dry state on filter paper for performing the virus-neutralizing reaction.

"3. Virus-neutralizing antibodies appear in birds' blood in the spring. The number of bird species which have antibodies is increased in the summer."

52. Clinical Picture of Tick-Borne Encephalitis

"Characteristics of the Clinical Picture of Tick-Borne Encephalitis in Regions of the Kuzbass With Different Population Groups," by A. V. Dubov, Clinic of Nervous Diseases, Novosibirskiy Medical Institute; Moscow, Voprosy Virusologii, Vol 2, No 6, Nov/Dec 57, pp 351-354

Essential differences in clinical manifestations of tick-borne encephalitis were studied in 1954-1955 in two neighboring regions of the Kuzbass. The two foci investigated are described with regard to topography, permanent and migratory population, and previous incidence of the disease. According to data collected by the Kemerovskaya Oblast Sanitary-Epidemiological Station, the *Ixodes persulcatus* tick was the

vector in both these foci. Data on clinical forms observed, relationship of these clinical forms to occupations of the patients, and restoration of work capacity in convalescents are tabulated. The following conclusions are offered on the basis of these results:

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"1. The clinical picture of tick-borne encephalitis differed in two adjacent foci having epidemiologically dissimilar population groups.

"2. The course of tick-borne encephalitis was severe in the focus with a primarily nonimmune population; localized forms with sequellae leading to invalidism predominated.

"3. In the focus with a population which had resided there for a long time and were naturally immune, the course of tick-borne encephalitis was comparatively mild and nonparalytic forms predominated.

"4. Natural immunization of the population is one of the factors connected with changes in the clinical picture of tick-borne encephalitis with regard to enlargement of the lungs and nonparalytic forms of the disease."

#### Hematology

53. Quinine Added to Glucose-Citrate Preserved Blood Increases Blood Oxygen Affinity for the First 20-40 Days

"Biochemical Changes in the Blood Preserved by the Addition of Quinine During the Process of Its Preservation," by G. V. Derviz, N. B. Chernyak, and S. A. Lazarevskiy; Sovremenyye Problemy Gematologii i Perelivaniya Krovi (Modern Problems of Hematology and Blood Transfusion), No 32, M., Medgiz, 1956, pp 115-120 (from Referativnyy Zhurnal -- Khimiya, Biologicheskaya Khimiya, No 17, 10 Sep 57, Abstract No 19358, p 101)

The addition of quinine to glucose-citrate preserved blood delays the onset of hemolysis in the preserved blood for 5-10 days and retards the rate of subsequent hemolysis. The capacity of such blood to take up oxygen varies: during the first 20-40 days, its affinity for oxygen increases, but on further preservation it decreases.

54. A Case of Acute Myelosis With Significant Hyperplastic Reaction of the Erythrocyte System Misdiagnosed as Pernicious Hemolytic Anemia

"A Case of Acute Myelosis With Significant Hyperplastic Reaction of the Erythrocyte System at Its Initial Period," Pediatr. Polska, 1956, No 9, 1019-1024 (Polish), (from Meditsinskiy Referativnyy Zhurnal, No 2, Section 2, Feb 57, p 66)

The disease of a 5-year-old child, during the first 3 months of his sickness was analyzed as due to anemia (53-25% hemoglobin, 2.9-1.34 million erythrocytes), leukopenia (3000-5000 leukocytes), relative lymphocytosis (56-80%), with normoblastosis at 4-24 per 100 leukocytes in the peripheral blood, and with 42% erythroblasts in the myelogram. Erythroblasts in the bone marrow amounted to 280 for 100 leukocytes. At this stage, the child became sick with diphtheria from which he recovered. Later, clinical and hematological symptoms characteristic for typical leukosis became evident and in 3 weeks led to the child's death.

"Naturally, at the beginning of the disease, the condition was diagnosed as pernicious hemolytic anemia."

55. Advancements in Clinical Hematology in USSR During the Last 40 Years

"Advancements in Clinical Hematology in the USSR During (the Last) 40 Years," by Prof D. N. Yanovskiy (Kiev), Moscow, Klinicheskaya Meditsina, Vol 35, No 7, Jul 57, pp 6-13

Advancements in the field of hematology in the USSR include both quality of work and quantity; for example, the library catalogue at Kiev lists more than 4,000 references on various problems of hematology.

The creation and the universal acceptance of the mild unitarian theory of hemopoiesis by the USSR has successfully crowned the first stage of the development of hematology, and in this light it is possible to evaluate the functional condition of hemopoiesis. This theory makes it possible to solve many problems through specially designed methods of research.

Topics in the field of hematology stressed include studies of the process and the regulation of hemopoiesis, the problem of leukosis, the pathology of the reticulo-endothelial system, agranulocytosis, aleukia, the significance of immunology in hematology, and culture studies with regard to hematology.

The article has many references to hematologists in the Soviet Union and abroad.

The author concludes that the USSR does not only lead the world in the field of hematology, but that it has unique schools of hematology where the science of hematology is progressively developing.

56. Book Published on Methods of Research and of Functional Evaluation of the Blood System

"Health and Medicine," Novyye Knigi, No 4, 26 Jan 57, p 16

The following book is listed under the "Health and Medicine" category:

"Nekotoryye Metody Issledovaniya i Funktsional'noy Otsenki Sistemy Krovoobrashcheniya (Certain Methods of Research and of the Functional Evaluation of the Blood System), by N. N. Savitskiy, L., Medgiz, Leningrad Department, 1956, 327 pp.

57. Significance of Anticoagulant Therapy Stressed in a Case of Thrombosis of Cavernous Sinus

"A Case of Cured Thrombosis of the Cavernous Sinus Simultaneously Accompanied by Septic Meningitis," Ceskoslov. Otolaryngol. No 5, 1956, 281-284 (Czech) (from Meditsinskiy Referativnyy Zhurnal, No 1, Section 2, Jan 57, p 99)

The author observed a patient diagnosed to have thrombosis of the cavernous sinus, meningitis, and sepsis. Cure was attained by the use of antibiotics, sulfonamide, and heparin. The author stresses the significance of anticoagulant therapy in cases of thrombosis of the sinuses.

Immunology and Therapeutics

58. Beta-Globulin Fraction Increased During Inflammation Caused by Turpentine

"On the Nature of Additional Globulin Fractions in the Blood Serum of Rabbits During Inflammation," by M. S. Surovikina, Tr. Stalinab. Med. In-ta. (Works of the Stalinabad Medical Institute), No 21, 1956, pp 167-171 (from Referativnyy Zhurnal -- Khimiya, Biologicheskaya Khimiya, No 17, 10 Sep 57, Abstract No 19105, p 77)

Turpentine administered into the subcutaneous cellular tissue of the abdomen of rabbits caused within 24 hours the development of inflammation, and changes were noted in the protein fractions and in the albumin/globulin

coefficients. It was noted that the albumin fraction was decreased, the albumin/globulin coefficient also was decreased, but the globulin fraction was increased due to an increase in the beta fraction.

Electrophoretic patterns revealed an additional peak which could be attributed to the beta-globulins.

59. Connections Between Burns and Allergies

"Burns and Allergy," by H. Hering, Dermatological Clinic of the Dresden-Friedrichstadt District Hospital, Das Deutsche Gesundheitswesen, No 50, 12 Dec 57, pp 1541-1544

Examples are given of actual and apparent coincidental conditions in illnesses caused by burns and allergy. After a brief description of the course of illness caused by burns, problems of histamine secretion and the effect of antihistamine, the treatment of shock through augmenting circulation by means of Periston N, Makrodex and Dextran, hormone therapy with ACTH and cortisones, and antibacterial treatment are discussed. Questions of traumatic scarlet fever, of scarlatinal exanthema, are approached from the viewpoint of the allergy theory.

Two tables show the success of modern theory and practice in the treatment of illness caused by burns.

Internal Medicine

60. Pathogenicity of Spirochetes in Tick-Borne Relapsing Fever

"A Study of the Pathogenicity of Spirochetes -- Pathogens of Tick-Borne Relapsing Fever," by L. V. Shtyreva, Za Sots. Zdravookh. Uzbekistana (For Socialist Public Health of Uzbekistan), No 5, 1956, pp 55-59 (from Referativniy Zhurnal -- Biologiya, No 18, 25 Sep 57, Abstract No 77539, by Z. A. Yakubovich)

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"Three pathogens of tick-borne relapsing fever are known within the USSR: *Spirochaeta sogdiana*, *Sp. caucasica*, and *Sp. latyschevi*. Unquestionably positive results were obtained through infection of 30 patients for pyrotherapy of spirochetemia (the first two types). The course of the disease was uniform. Infection developed in only six patients out of 12 infected with two strains of *Sp. latyschevi*. The disease course was mild. In the author's opinion, *Sp. latyschevi* is less pathogenic for humans than the first two."

61. Combined Use of Cortisone and ACTH in Treatment of Chemical Burns of Esophagus Not Accompanied by Stenosis

"Therapy of Chemical Burns of the Esophagus by Cortisone and ACTH," Ceskoslov. Otolaryngol. No 5, 1956, 313-318 (Czech), (from Meditinskiy Referativnyy Zhurnal, No 1, Section 2, Jan 57, p 83)

A short summary is presented of the etiology, pathogenesis, and therapy of chemical burns of the esophagus. The author describes his personal observations of esophageal burns by ammonium. A new therapeutic method using cortisone and ACTH has been developed. Therapy by this method is not accompanied by stenosis.

62. Brucellosis in East German Agricultural Workers

"Tests On Workers of Two Agricultural Enterprises for Morbus Bang," by Paul Hans, Das Deutsche Gesundheitswesen, No 46, 14 Nov 57, pp 1438-1443

The Greifswald District Hygiene Institute conducted diagnostic tests for brucellosis on 113 persons (56 adults and 57 youths) who were employed at an agricultural producers' cooperative (LPG), a state-owned farm (VEG), or attending a farm school connected with the state-owned farm. The institute learned of the high incidence of brucellosis among the stock of the farms from the Greifswald Veterinary Office (Tiergesundheitsamt). At the agricultural producers' cooperative, a total of 35 persons were tested; six persons (17%) reacted positively. At the state-owned farm 30 persons were tested, and 16 (53%) reacted positively. At the farm school 48 persons were tested, and 24 (50%) reacted positively. The high incidence of the disease at the farm school was traced to the fact that the students had been given raw milk from the infected herds for some time. The 46 persons showing positive reaction were classified (according to Tuszkiewicz) as follows: Group A (active brucellosis), one case; Group B (inactive brucellosis), 11 cases; and Group C (sensitive to brucellosis antigens), 34 cases.

63. Brucellosis Infection in a Human

"Casuistic Contribution to Human Brucellosis Infection By Diseased Swine," by G. Strube, Ballenstedt Hospital, Berlin, Das Deutsche Gesundheitswesen, No 46, 14 Nov 57, pp 1435-1438

On 26 February 1957 the illness of a 21-year-old patient, an attendant at a pig farm, was diagnosed at the Ballenstedt (Harz) Hospital as Brucellosis suis. The patient recovered completely after 4 weeks' treatment with a combination of streptomycin and chloronitrin.

The article includes a complete description of the symptoms and clinical tests during the diagnosis, a brief survey of the literature on brucellosis suis in humans, and a discussion of methods of treatment as reported in the literature.

Military Medicine

[See Item No 67.]

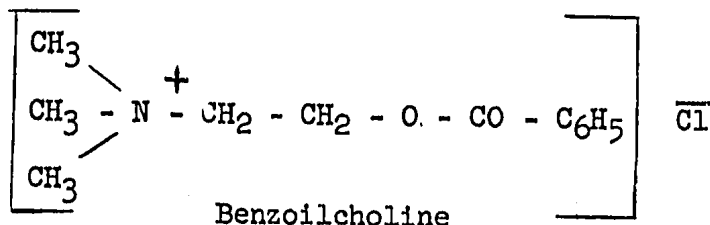
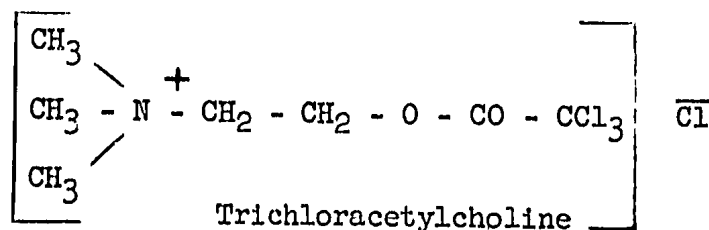
Pharmacology and Toxicology

64. The Toxic Effect of Trichloracetylcholine

"The Pharmacology of Trichloracetylcholine," by P. F. Ganzha, Chair of Pharmacology and Pharmacy (chief, Prof S. Ya. Arbutov), Military Medical Order of Lenin Academy imeni S. M. Kirov; Moscow, Farmakologiya i Toksikologiya, No 4, Jul-Aug 57, pp 32-35

For theoretical reasons and because of the requirements of practical medicine, certain new derivatives of choline (including trichloracetylcholine) were synthesized by members of the Chair of General Chemistry at the Military Medical Order of Lenin Academy imeni S. M. Kirov (M. Z. Zalmanovich, 1953) together with the members of the Chair of Pharmacology. Since there is no data in Soviet literature concerning the pharmacological properties of mono-, di-, or trichloracetylcholine, the author explains, the purpose of this work is to investigate these properties. Tests were also conducted with benzoilcholine to determine the dependence of pharmacological action on the chemical structure of a compound.

Structural formulas of the preparations were:



The tests, which involved the administration of the compounds in various doses to rabbits, cats, dogs, mice and frogs, were subdivided according to the following main categories: (1) general action and toxicity, (2) effects on the cardiovascular system and respiration, and (3) changes in the function of vegetative innervation due to the effect of trichloroacetylcholine.

On the basis of the data collected, the following conclusions were arrived at:

"1. Trichloroacetylcholine possess expressed hypotensive properties. In animals, both under anesthesia (dogs, cats, rabbits) and without anesthesia (dogs, rabbits), blood pressure is reduced. As a side reaction to the hypotensive action, mild stimulation in respiration was observed.

"The degree to which blood pressure is lowered, and the duration of the depressor reaction depends on the dosage and method of administration.

"2. The action of trichloroacetylcholine on vegetative parasympathetic innervation and the vegetative ganglia is comparable to the action of acetylcholine, and differs only by being less intensive. After an injection of trichloroacetylcholine, salivary and gastric juice secretion is markedly reduced when compared to the administration of a comparable dose of acetylcholine or carbocholine.

"3. The toxic properties of trichloroacetylcholine are significantly lower than those of acetylcholine and carbocholine.

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"4. The dependence of pharmacological action on the chemical structure was observed with the aid of a homologous series of choline derivatives:

"a. Substituting acetic acid for trichloracetate in the molecule of the acetylcholine radical decreases the parasympatheticomimetic properties and increases the action of the vasomotor centers.

"b. The addition of the phenyl radical (benzoilcholine) to the choline molecule increases the action of the n-choline receptors while decreasing its effect on the m-choline receptors."

65. The Effects of Adenosine-Triphosphoric Acid on Synaptic Transmission Blocks

"The Effect of Adenosine-Triphosphoric Acid on the Transmission of Excitation in the Superior Cervical Ganglion During Synaptic Transmission Blocking by Gangliolytics," by N. B. Visotskaya, Laboratory of Special Pharmacology (chief, Prof V. V. Zakusov, Member of Academy of Medical Sciences USSR), Institute of Pharmacology and Chemotherapy, Academy of Medical Sciences USSR; Moscow, Farmakologiya i Toksikologiya, No 4, Jul-Aug 57

This work, the investigator states, was conducted in connection with previous work involving gangliolytics (nicotine, pachycarpine, tetraethylammonium and pentamine) which produce changes in the normal ratio of the organic and inorganic phosphorous fractions found in the superior cervical ganglion.

CPYRGHT the basis of the data collected, the author concludes that:

"1. A block in transmission of excitation in the superior cervical ganglion which is caused by nicotine, pachycarpine, pentamine, or tetraethylammonium is reduced by the introduction of adenosine-triphosphoric acid.

"2. The introduction of adenosine-triphosphoric acid does not alleviate difficulties in transmission produced by hexone.

"3. Normally, small doses (2-4 mg/kg) of adenosine-triphosphoric acid facilitates the transmission of excitation in the superior cervical ganglion. However, larger doses have an opposite effect."

66. Investigation of the Pharmacological Properties of the Cardiac Glucoside, Gofruside

"On the Pharmacology of Gofruside," by E. I. Gendenstein, Pharmacological Laboratory (chief, Docent P. I. Onitsev), Kharkov Scientific Research Chemical Pharmaceutical Institute; Moscow, Farmakologiya i Toksikologiya, No 4, Jul-Aug 57

The purpose of the investigation, the author explains, was to study the general pharmacodynamics of gofruside, a cardiac glucoside extracted from the seeds of *Gomphocarpus fruticosus* L. by D. G. Kolesnikov and V. T. Chernobay at the Karkhov Scientific Research Chemical Pharmaceutical Institute. According to its physicochemical properties, this cardiac glucoside is identical to the gofruside ( $C_{29}H_{42}O_9$ ) which was described by Keller and Reinstein (1949).

The following properties were investigated: biological activity on cats, frogs, and guinea pigs; toxicity after various methods of administration; duration of the action; accumulation following repeated administration; and rate of elimination.

On the basis of the data collected, the following conclusions were reached:

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- "1. Gofruside has the characteristic action of cardiac glucosides.
- "2. Gofruside possesses marked biological activity. One KED amounts to  $0.256 \pm 0.029$  mg/kg; One LED for frogs, *Rana temporaria*, amounts to 0.03 mg. LD for the *Rana esculenta* frog was 0.4 mg; for guinea pigs,  $3.55 \pm 0.53$  mg/kg.
- "3. The strength of the action of gofruside depends essentially on the method of administration. A rapid, strong reaction is produced by internal injection. With introduction into the intestines, its action is sharply reduced.
- "4. The action of gofruside is short lived. Following internal administration of a 0.5 KED dose, its action ceases after 6 hours.
- "5. Gofruside is practically noncumulative.
- "6. Gofruside is quickly rendered harmless by the organism. It is eliminated from an organism at the rate of 0.23 KED/hr.
- "7. Because of its pharmacodynamics, gofruside is related to the noncumulative group of cardiac glucosides, the periplocins."

67. Chlortetracycline Used Successfully in the Treatment of Experimental Gas Gangrene

"The Effectiveness of Peroral Administration of Chlortetracycline in Experimental Gas Gangrene Infection," by K. A. Ponomarev, Chair of Microbiology (head, Prof A. A. Sinit-skiy), Military Medical Academy imeni S. M. Kirov; Moscow, Antibiotiki, No 6, Nov-Dec 57, pp 27-30

After a detailed description of experimental infection of mice and guinea pigs with *Clostridium perfringens* and *Cl. septicum* alone and in combination and their treatment by peroral administration of chlortetracycline, the author arrives at the following conclusions:

"1. A single peroral administration of chlortetracycline immediately after infection [introduction of the microorganisms into an experimentally inflicted wound in the hip] protects mice against lethal infection caused by *Cl. perfringens* or *Cl. septicum*, and/or a combination of these two anaerobes and pyogenic cocci.

"2. After delayed peroral administration of a single dose of chlortetracycline to white mice suffering from an experimental gas gangrene infection, the antibiotic displays a well-expressed protective action if it has been administered no later than one hour after infection.

"3. In experiments on guinea pigs, recovery of the animals from an anaerobic infection was achieved by repeated peroral administration of the preparation (immediately after infection and every 4-5 hours thereafter).

"4. The high effectiveness of peroral administration of chlortetracycline in experimental gas gangrene infection makes it a good prospect for the prophylaxis and therapy of gas gangrene infection in wounded humans.

68. Chinese Study Oxidation-Reduction Potential and Aureomycin Potency of Streptomyces aureofaciens Culture

"Experiments on Oxidation-Reduction Potential and Aureomycin Potency of Streptomyces aureofaciens Culture," by Fang Hsin-fang (方心芳), Liu Su (刘肃), and Yang Hui-fang (杨惠芳), Peiping Microbiological Laboratory, Academia Sinica, in collaboration with Liu Shu-t'ien (刘书田), Department of Pharmacology, Peking Medical College; Peiping, K'o-hsueh T'ung-pao (Scientia), No 23, 1957, p 720

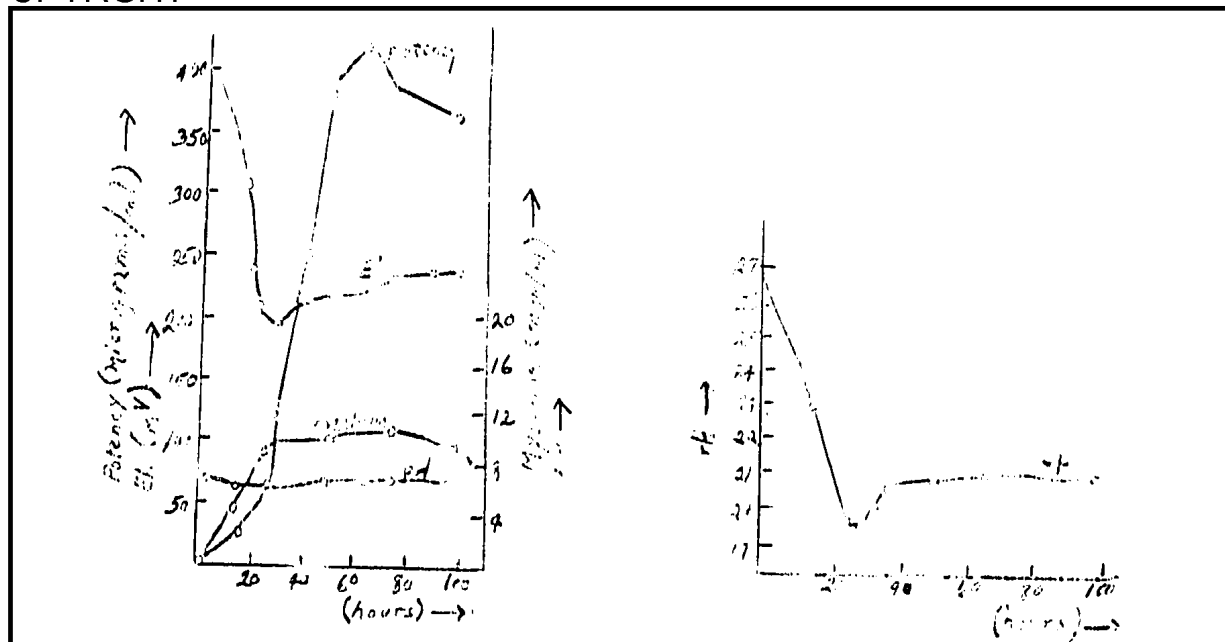
This article reports experiments undertaken to observe changes in oxidation-reduction potential of Streptomyces aureofaciens culture during the course of fermentation. In the study of this subject, about which the authors say there is no literature, the rH curve was plotted, and the potency of the culture was compared with the concentration of mycelium. For this experiment, a commercial strain, designated K 1001, was chosen and cultural conditions used for it at the Shanghai Industrial Research Laboratory of the Ministry of Light Industry were followed. The article gives a presentation of fermentation and determination techniques.

Experimental results demonstrated that the oxidation-reduction potential of Streptomyces aureofaciens during the production of aureomycin can be determined repeatedly and that the separate results will not vary more than 20 mV. The oxidation-reduction potential curve and the rH curve for this organism resemble those for aerobic microorganisms in general. The Eh, which was within the range of 350-400 mV at the beginning of fermentation, dropped rapidly as the mycelium multiplied, reaching its lowest point (approximately 200-180 mV) after 30 hours. The potential then gradually rose and remained at 225-235 mV. Graphs, reproduced below, show that the organism began producing aureomycin in small quantity as soon as it began to grow. After 30 hours' fermentation, the production had attained 14 percent of total yield. Production was best after the oxidation-reduction potential rose from its lowest point to a rather stable voltage. The presence of  $\text{CaCO}_3$  in the culture medium prevented much change in pH, and the rH remained within the range of 19-27 throughout the experiment.

Graph 1 shows the changes in the oxidation-reduction potential, pH, aureomycin potency, and amount of mycelium in culture of Streptomyces aureofaciens K 1001 during 98 hours of fermentation. The horizontal scale indicates fermentation time in hours. The left vertical scale represents oxidation-reduction potential (Eh) in millivolts, and also aureomycin potency in micrograms aureomycin per milliliter filtrate. The right vertical scale represents pH and dry weight of mycelium in milligrams per milliliter filtrate.

Graph 2 shows changes in rH during 98 hours of fermentation. In this graph the horizontal scale indicates fermentation time in hours; the vertical scale, rH value.

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Graph 1

Graph 2

69. Chinese Determine Optimum Conditions for Aspergillus Cultivation

"Studies on the Submerged Culture of Amylase-Producing Aspergillus," by Hsiao Yung-lan (肖永瀾), Yen Tzu-cheng (严自正), and Fang Hsin-fang (方心芳), Peiping Microbiological Laboratory, Academia Sinica; Peiping, K'o-hsueh T'ung-pao (Scientia), No 23, 1957, p 721

This item reports the results of experiments designed to identify the best amylase-producing strain among the several hundred strains of Aspergillus preserved in the authors' laboratory. Asp. awamori No 3.75, a black strain, was selected as the highest in amylolytic activity when cultured in several types of media. Further experiments to determine optimum conditions for this organism's formation of amylase were conducted and the results reported in the article.

Public Health, Hygiene, and Sanitation

70. Detection of Virus Aerosols

"A Method of Detecting a Virus Aerosol," by A. F. Vizitiu, Sb. Nauch. Rabot. Mold. Otd. Vses. Nauch. O-va Mikrobiol., Epidemiol., i Infektsionistov (Collection of Scientific Works of the Moldavian Branch of the All-Union Society of Microbiologists, Epidemiologists, and Infectionists), No 1, 1956, pp 51-58 (from Referativnyy Zhurnal -- Biologiya, No 18, 25 Sep 57, Abstract No 77162, by V. V. Vlodavets)

CPYRGHT

"An aerosol of type A influenza virus (Shklyaber strain) was formed in an experimental chamber with a volume of 1 M<sup>3</sup> by dispersing a suspension of mouse lung tissue. Influenza virus was detached in the air by the method of natural aspiration in white mice one hour and 30 minutes after dispersal. By aspirating 50 liters of air with the Rechmenskiy virus collector, influenza virus was detected in the air of the chamber within 5 hours by subsequent intranasal infection of white mice, and within 9 hours by infection of chick embryos. Influenza virus was detected in the air within 30 minutes by performing the hemagglutination reaction with liquid from the Rechmenskiy apparatus, and after one hour by the micro-electrophoresis method (influenza virus altered the electrokinetic mobility of the erythrocytes)."

71. Hexachlorane Smoke Pots

"The Utilization of Hexachlorane in the Insecticidal Smoke Pot, Type NBK (G-17), in the Reindeer Industry," by Candidate of Veterinary Sciences A. Kh. Layshev, Taymyr Agricultural Testing Station; Moscow, Veterinariya, No 2, Feb 58, pp 88-90

During the last 2 years, the author explains, a new smoke pot, of the NBK (G-17) type filled with hexachlorane, was used in the Taymyr National Okrug to rid the area of blood-sucking diptera, mosquitoes, and midges which interfere with the reindeer industry.

One pot, the author states, will burn from 25 to 28 minutes and will effectively cover an area of 4,000 sq m (an area 250-300 m in length and varying from 4 to 6 m in width near the pot to 18 to 20 m near the end of the smoke zone). The area covered by the smoke depends on the relief of the area and on meteorological conditions (basically, the velocity of the wind). Best results are obtained with a wind velocity of one to 2 m/sec. No ill effects were produced on the reindeer; however, 2 or 3 days passed before the reindeer became accustomed to the smoke.

Hexachlorane smoke pots, the editors point out, can be obtained in any amounts from local veterinary supply offices.

72. The Use of Hexachlorane in Exterminating Ticks

"The Utilization of Hexachlorane in the Fight Against Ticks -- Transmitters of Tick-Borne Relapsing Fever in Villages," by M. V. Pospelova-Shtorm, Department of Entomology (director, Prof V. N. Beklemishev), Institute of Malaria, Medical Parasitology and Helminthology (director, Prof P. G. Sergiyev), Ministry of Public Health, USSR; Frunze, Sovetskoye Zdravookhraneniye Kirgizii, No 5, Sep-Oct 57, pp 50 - 53

The author presents a review of the successes and methods of utilizing hexachlorane (hexachlorocyclohexane) for exterminating ticks which carry relapsing fever. In Africa, the author points out, where the use of hexachlorane is standard procedure, the incidence of relapsing typhoid has been greatly reduced and practically liquidated, for example, in Somaliland.

CPYRGHT On the basis of the material she presents, the author concludes:

"1. Hexachlorane, at present, appears to be the best acaricide for exterminating flies and merits wider use in practice.

"2. In the fight against ticks, the best results are obtained by a combined method of treatment (dry and wet). The treatment of tick infested animal barns also gives good results.

"3. The wet method is efficient if high doses of hexachlorane are used.

"4. Depending on the type of structure and relief of the wall surface, the number of fissures, burrows, and openings, a variable dose is suggested: from 3 - 4 to 6 - 7 grams of technical preparation per square meter of surface.

"5. On forests, a dust suspension of hexachlorane gives better results than a solution or emulsion.

"6. Hexachlorane should be handled as a poison; several accidents have occurred because of improper handling. To produce a toxic effect, large doses of the preparation would have to be taken internally. However, inhaling small doses can produce unpleasantness in humans.

"7. Since large doses of hexachlorane are required to treat animal buildings for ticks, making it dangerous and unpleasant for the animals, good natural ventilization is required.

CPYRGHT

"8. At present, until there is a preparation as effective against ticks and less unpleasant and toxic to warm-blooded animals, the utilization of hexachlorane, for the antitick fight in tick-borne relapsing fever foci is justified and necessary."

73. Microflora of Moscow Atmosphere Investigated

"Microflora of the Atmospheric Air of Moscow," by Kh. L. Galikayev, Sb. Nauch. Rabot. Mold. Otd. Vses. Nauch. O-va Mikrobiol., Epidemiol., i Infektsionistov (Collection of Scientific Works of the Moldavian Branch of the All-Union Society of Microbiologists, Epidemiologists, and Infectionists), No 1, 1956, pp 5-12 (from Referativnyy Zhurnal -- Biologiya, No 18, 25 Sep 57 Abstract No 77299, by V. V. Vlodavets)

CPYRGHT

"During 1951, 480 samples of atmospheric air in different areas of Moscow were collected with the Rechmenskiy bacteria collector. The samples were collected with the help of an automobile motor, in operation (distance method) and standing still. Thirty-four strains of Streptococcus were isolated, mainly in March and October. Biologically active Staphylococcus were most frequently detected in the fall and spring months. High seeding of the air with Staphylococcus was noted upon beating soft objects, and loading and unloading garbage. During the cold time of year, the number of saprophytes consisted of 150-300 per M<sup>3</sup>. During the summer, the number was increased and reached its maximum in dry, windy weather, i.e., 58,000. Bacterial seeding of the air was considerably lower in regions where there was foliage than in regions occupied by houses, streets, and buildings."

74. Prophylaxis of Influenza by Disinfection of the Air

"Air Disinfection as a Method of Prophylaxis of Influenza," by Z. I. Merekalova, Tr. Tsentr. N.-I. Dezinfekts. In-ta (Works of the Central Scientific Research Disinfection Institute), No 9, 1956, pp 44-50 (from Referativnyy Zhurnal -- Biologiya, No 18, 25 Sep 57, Abstract No 77160, by V. V. Vlodavets)

CPYRGHT

"A good virucidal effect is afforded by a 0.5% solution of chlorinated lime, a 1% solution of chloramine, and 2 and 4% solutions of formalin (by moistening the floor). Formalin cannot be used when people are present because of its acrid odor and irritating effect on the mucous membranes. Moistening the floor with lactic acid does not provide a virucidal effect."

75. Reservoir Contamination Investigated

"The Effect of Various Sectors of Contamination on the Qualitative Characteristics of the Water in Reservoirs," Moldavian Scientific Research Institute of Epidemiology, Microbiology, and Hygiene, Sbornik Trudov (Collection of Works), Kishinev, No 2, 1956, pp 141-143 (from Meditzinskiy Referativnyy Zhurnal, No 1, No 9, Sep 57, pp 53-54)

CPYRGHT

"The building of reservoirs on a river during dam construction sometimes involves flooding and submersion of a considerable amount of territory on which populated points, industrial enterprises, various agricultural areas, etc., are frequently located. This necessitates preparing the area to be covered by the future channel to ensure that the condition of the reservoir will be sanitary for a long time. The unusual nature of the water during the first stage of its existence is a peculiarity of a reservoir which is related to flooding large areas, washing out a great amount of organic products, and abrupt change in the hydrological regime. The author presents results of observations on the nature and extent of the effect of flooding areas on the quality of the water in the future reservoir. For this purpose, soil samples taken from various sites in the area of the future reservoir were inundated with river water under laboratory conditions for 10 days to one year.

Investigations were carried out along two lines: some of the inundated samples were stirred up periodically, and the rest were left in a calm state. Examination of the soil showed that samples from animal husbandry farms of the kolkhoz were characterized according to their chemical-bacteriological indexes by the greatest degree of contamination, samples from fruit orchards on the flooded peninsula were next, and finally samples from vineyards. Soil collected for examination from a kolkhoznik's arable and cultivated farm can be characterized as relatively pure. Results of investigating the extent of self-purification in these soil samples showed that the most pronounced processes of self-purification occurred in the soil of the arable region, the flooded peninsula, the fruit orchard, and in soil from the animal husbandry farm of the kolkhoz. It was observed that the chemical indexes of the water became worse during the second month after flooding; this effect was still expressed 8 months after flooding. The bacteriological indexes were observed to become worse within 5-10 days after flooding; however, after 2 months these indexes became equal to those of the river water. Soil samples from the animal husbandry farm, the fruit orchard, the flooded peninsula, and the vineyard had the most pronounced effect on deterioration of the properties of the water. Soil samples from the arable region and the kolkhoznik's garden have an insignificant effect on the properties of river water."

[For additional information on public health, hygiene, and sanitation, see Item No 21.]

Radiology

76. Use of Radium Needle Preferred Over Surgical Intervention in Cases of Enlarged Adenoids

"Concerning the Problem of Improving Hearing by Radium Irradiation of Nasopharynx," Otolaryngol. Polska, 3-4, 1956, pp 335-340 (Polish), (from Meditsinskiy Referativnyy Zhurnal, No 1, Section 2, Jan 57, p 75)

Enlargement of adenoids often causes diminished hearing and inflammation of the middle ear. Instead of surgical intervention, which often is ineffective, the author recommends the use of a 50 mg, 0.33-mm-thick "radionasal" radium needle. The needle is introduced through the nose into the nasopharynx, for 6-12 minutes. Irradiation is repeated within 3-4 weeks, for 3-4 times. Total dose on the surface of nasopharynx is 1,500-2,800 r.

Histological data of the irradiated tissue, 24-48 hours after irradiation, reveal cessation of mitosis, fragmentation of nuclei, and in certain cases disintegration of cells.

This method of radium therapy was conducted on 60 patients, 55 of whom were children. No adverse results followed.

Space Medicine

[See Item No 10.]

Surgery

77. Localization Rather Than Extent Proven Primary Factor in the General Response Reaction of Organisms to Burns

"The Significance of Localization of Burns in the General Response Reaction of an Organism," by S. B. Fabrikant, Sov. Zdrav. Kirgizii (Soviet Public Health of Kirgizia), 1956, No 2, 25-27 (from Meditzinskiy Referativnyy Zhurnal, No 1, Section 2, Jan 57, p 11)

Two series of experiments were conducted on rabbits to determine the significance of localization of burns.

Following "large" burns of the abdominal region and of the hind extremities (34% of the total body surface), no death was observed for the first 3 hours.

When "small" burns (2-4% of the total body surface) were inflicted on the chest region there was a quick and sometimes an immediate fall of blood pressure to zero, and all experimental animals died very quickly, on the average within 41 minutes.

The author concludes, therefore, that localization of burns is the primary factor in the general response reaction of an organism to this form of trauma, rather than whether the surface area covered by burns is large or small.

Veterinary Medicine

78. Study of Adrenal Glands of Dog During Distemper, Rabies, and Collapse

"Histomorphology and Dynamics of the Adrenal Glands of the Dog During Distemper and Rabies, As Well As During Collapse," by D. Matthia, Friedrich Loeffler Institute, Island of Riems, Archiv fuer Experimentelle Veterinaermedizin, Vol 11, No 3, May/June 57, pp 459-518

The adrenal cortex of the dog, unlike that of the pig and small laboratory animals, does not undergo disorganization in the form of a progressive external transformation after the administration of ACTH. In the case of the dog, the criteria of an increase in activity of the cortex are disintegration of cortical cell nuclei, the appearance of polymorphonuclear leucocytes predominantly in the capillaries of the cortex, and hyperplasia chiefly of the cells of the Zona fasciculata with indications of a

displacement of the Zona arcuata. ACTH-induced atrophy of the sudanophilic and doubly refracting fats extends, in the case of the dog, only to the Zona fasciculata and Zona reticularis, whereas the Zona arcuata shows no reaction.

In distemper and rabies, similar cortical changes take place, the extent of which, however, differs with each of these virus diseases. In the case of nervous distemper, the adrenal cortex at times shows such extensive changes as to indicate an exceeding of the functional capacity of the cortex in such a way that an insufficiency of the cortex might occur. On the other hand, in the case of catarrhal distemper, the adrenal cortex shows only a moderate activation, whereas the cortical changes in the case of rabies lie between the extremes of intensity of these two types of distemper. Since the same changes also occur after the application of various collapse toxins, it is a case here of nonspecific reactions, in which the quality of the stimulus plays no role and which are to be viewed as a stress state of the organism.

In the case of nervous distemper and rabies, the adrenal medulla shows only a slight decrease of chromatizability; with catarrhal distemper, however, there is an extensive atrophy of the chromaffin substance, which is complete in the case of toxically conditioned collapse states.

After the application of various collapse toxins, the gastrointestinal canal undergoes changes which can also be observed in the case of catarrhal distemper and which represent primarily a disturbance of circulation which becomes progressively more intense in experimentally induced collapse. Since symptoms of circulatory disturbance and extensive atrophy of the chromaffin substance of the medullary layer are observed only in the case of catarrhal distemper, these two changes may have a causal connection. The simultaneous involvement of cortex and medulla in catarrhal distemper and experimentally induced collapse states, and the lack of essential medullary changes in the case of nervous distemper and rabies, which are not involved in circulatory disturbances, indicate the participation of both parts of the adrenal glands in collapse, but also show that the changes of medullary layer are of greater importance for the occurrence of circulatory disturbances. Since collapse phenomena are lacking in the case of catarrhal distemper, no statements can be made on the probable attack site of the distemper virus in regard to its dynamic circulatory effect.

79. Blood Changes in Hog Cholera

"On Changes of the Blood in Hog Cholera," by D. Matthias and D. Schmidt, Friedrich Loeffler Institute, Island of Riems, Archiv fuer Experimentelle Veterinaermedizin, Vol 11, No 3, May/June 57, pp 519-537

The blood of 45 hogs was tested before and after infection with the virus of hog cholera. A considerable anemia and almost complete atrophy of the reticulocytes of the circulating blood occur during the course of this disease. Regular occurrence of inclusion bodies in some of the erythrocytes was also observed. Shortly before the death of the animals, the viscosity and protein content of the blood plasma increase considerably. A regular decrease in the residual nitrogen content was observed in the plasma of the infected animals. The sodium and potassium contents of the blood plasma during the course of the disease varied both independently and with respect to one another. In a majority of cases, however, the calcium content of the blood decreased, thereby leading to a considerable increase in the K/Ca-quotient, so important for reactions of the vegetative nervous system. The significance of these findings is discussed, and similarities between some of the blood changes occurring in hog cholera and those occurring in infectious equine anemia are pointed out.

[For additional information on veterinary medicine, see Item No 62.]

Virology

80. Penetration of Street Rabies Virus Through Nose and Eye Membranes Studied

"Experimental Study of the Penetrability of the Street Rabies Virus Through the Mucous Membranes of the Nose and Eye," by I. A. Svet-Moldavskaya, State Control Institute of Vaccines and Sera imeni Tarasevich, Voprosy Virusologii, Vol 2, No 6, Nov/Dec 57, pp 338-341

This article presents results of extensive research on the ability of the street rabies virus to penetrate the mucous membranes of the animal organism. It is mentioned that earlier investigations had verified the susceptibility of mice and rats to oral infection with this virus. In the present experiments, attempts were made to determine whether mice, rats, and rabbits could be infected with the street rabies virus through mucous membranes of the nose and eye. Results and pathomorphological changes observed in the infected animals are described.

CPYRGHT Conclusions drawn from the results of these experiments are as follows:

"1. The virus of street rabies can penetrate the mucous membranes of the nose and eye of rabbits, rats, and mice under experimental conditions. Clinical manifestations of the disease were observed only in rabbits and mice.

"2. The specific pathogen appeared consistently in the central nervous system and salivary glands of animals with clinical manifestations of rabies. The virus was isolated from the brain and salivary glands during the incubation period in individual cases and also from clinically healthy animals sacrificed 1 1/2 - 2 months after infection.

"3. Pathomorphological changes in the central nervous system characteristic of rabies, including the presence of Negri bodies, were observed in all diseased animals and in some clinically healthy animals sacrificed at different times after infection. In the rest of the animals, affection of the central nervous system was limited to inflammation of the vascular walls and degenerative changes in the nerve cells."

81. Work of Perm Virology Laboratory

"The Study of Virus Infections by Perm Microbiologists," by A. V. Pshenichnov, Voprosy Virusologii, Vol 2, No 6, Nov/Dec 57, pp 331-335

The above article summarizes studies of regional virology in the Urals since the opening of the Oblast Scientific Research Virology Laboratory in Perm (1939), which was reorganized and became the Virus-Rickettsial Division of the Perm Institute of Vaccines and Sera (1955).

Much of the article is devoted to research on tick-borne encephalitis, of which a distinct "Ural" variant of the virus has been established. Isolation of the virus, discovery of reservoirs, and transmission of the disease to humans are discussed. After observing the transmission of tick-borne encephalitis from goats to humans by an alimentary route, A. Smorodintsev described the resultant disease in humans as a new form of neuroinfection, two-wave meningoencephalitis; the author, however, disagrees with this designation, stating that according to his own experience tick-borne encephalitis seldom appears as a clinical-epidemiological variant. He prefers to explain the diphasic clinical picture of this disease as simply a peculiarity of pathogenesis. Other clinical forms of tick-borne encephalitis are discussed and explanations for them are offered.

On the basis of results obtained during several years' experimentation and testing, the author recommends goat hyperimmune serum for the prophylaxis and therapy of tick-borne encephalitis in humans. An "anavaccine" proposed by Smorodintsev has also been found to be effective against the

disease, according to this report. Certain difficulties encountered in connection with mass inoculation in the Urals where the disease is widespread but not concentrated in any particular area have made feasible the testing of combined vaccines; a vaccine against typhoid and tick-borne encephalitis, which has produced good results in mice, is considered to be prospective. In the author's opinion, further study of other combinations in vaccines is indicated.

The author refers to recent work on culturing of filterable viruses in tumor tissue. In early experiments, Kroker's sarcoma and mouse ascitic carcinoma were used to culture tick-borne encephalitis virus; this method met with greater success than the method of isolating the virus from the brains of infected mice. (Minayeva, 1952-1954). Favorable results of the "tumor" method were also obtained in culturing poliomyelitis and Yayvinskiy meningoencephalitis viruses and certain Rickettsia.

In connection with outbreaks of unique forms of gastroenteritis in 1945, workers of the Perm Laboratory made unsuccessful attempts to detect a bacterial pathogen, whereupon a virus etiology was suggested. When cultures could not be isolated from laboratory animals or chick embryos, filtrates of feces from patients were introduced into laboratory workers and to two other volunteers; in two cases, an analogous infection developed after 5-7 days. It was concluded from these circumstances that specific intestinal virus infections occur in the human.

A benign neuroinfection with a unique clinical picture was observed by the author during the warm months of 1950 in an extremely swampy region and did not recur in succeeding years. It was decided on the basis of virological, entomological, and clinical investigations that the disease was caused by a particular virus and was transmitted by mosquitoes; the author regrets that no further information was obtained.

The article concludes with mention of 1956 research on a method of tissue culture for work on poliomyelitis virus.

## 32. Polio Vaccination in the USSR

"In the Presidium of the Academy of Medical Sciences USSR" (unsigned article); Moscow, Vestnik Akademii Meditsinskikh Nauk SSSR, No 1, Jan/Feb 58, p 94

Prof M. P. Chumakov, director of the Institute for the Study of Poliomyelitis, Academy of Medical Sciences USSR, reported at the 4 December 1957 meeting of the Presidium of the Academy of Medical Sciences USSR on the results of the work of the institute in producing experimental vaccines against poliomyelitis. The first tests of the monovaccine with satisfactory results were conducted by the institute in June-July 1956.

Mass production of the experimental vaccine was begun in September 1956. During this time the institute worked out the technology of mass production of the vaccine, prepared instructions for the control and production of the vaccine, and introduced suggestions for the use of the subcutaneous method of vaccination. During 1956-1957, the institute produced nearly 1,500 liters of vaccine, including the trivaccine, the divaccine, and the monovaccine.

The first two series of the monovaccine used against the first type of poliomyelitis were used in Moskovskaya Oblast, and in particular in Moscow; the vaccine was also sent to other areas of the RSFSR, the Kazakh SSR, the Estonian SSR, and the Lithuanian SSR.

Miscellaneous

83. New Institutes Organized Within the Academy of Medical Sciences USSR

"In the Presidium of the Academy of Medical Sciences USSR" (unsigned article), Moscow, Vestnik Akademii Meditsinskikh Nauk, No 1, Jan/Feb 58, pp 91-92

Prof V. N. Orekhovich, academician-secretary of the Department of Medicobiological Sciences, Academy of Medical Sciences, reported at the 14 August 1957 meeting of the Presidium of the Academy of Medical Sciences USSR on basic progress in the work on geriatrics. The Presidium acknowledged the necessity of organizing within the system of the Academy of Medical Sciences USSR an Institute for the Study of the Problems of Longevity (Institut po Izucheniyu Problemy Dolgoletiya).

Prof S. M. Bagdasar'yan, chief of the Division of Scientific Medical Information, Institute of the Organization of Public Health and the History of Medicine imeni N. A. Semashko requested the Presidium of the Academy of Medical Sciences USSR to organize within the system of the academy a Scientific Research Institute of Scientific Medical and Medico-technical Information (Nauchno-Issledovatel'skiy Institut Nauchno-Meditsinskoy i Mediko-Tekhnicheskoy Informatsii). Since the future development of medical science requires broad information for scientific workers and physicians on the achievements of Soviet and foreign medical science and technology, the Presidium has agreed to organize this institute.

84. Conference on Bacterial Preparations Held in Moscow

"Interinstitute Conference -- 'Scientific Bases of the Production of Bacterial Preparations,'" by V. M. Perehygin and N. G. Cherebova, Sovetskoye Zdravookhraneniye Kirgizii, No 5, Sep/Oct 57, pp 63-64

A conference devoted to the production of bacterial preparations which was held in Moscow from 9 to 12 April 1957 is reported in this article. Sixty-one reports were heard; subjects covered included the improvement of poliomyelitis, smallpox, and rabies vaccines and the preparation of specific gamma globulins. The most outstanding among these reports are described briefly.

Personnel from the following institutes participated in the conference with reports on the topics mentioned: the Institute of Poliomyelitis, Academy of Medical Sciences USSR -- production of a Salk-type polyvalent vaccine against poliomyelitis, 10,000 liters of which is being prepared from strains cultured in monkey kidney and muscle tissue and will be used to inoculate children under 6 years old; the Institute of Vaccines and Sera imeni Mechnikov and the Moscow Institute of Epidemiology, Microbiology, and Hygiene -- preparation of poliomyelitis sera and specific gamma globulin, which has been tested at Children's Hospital imeni Dzerzhinskiy; Moscow Institute of Vaccines and Sera -- antirabies vaccine containing a minimum amount of nerve tissue and prepared in chick embryos and in tissue culture (new specifications for producing and instructions for using weaker antirabies vaccines containing less phenol are recommended); the Belorussian Institute of Epidemiology and Microbiology and the Odessa Institute of Epidemiology and Microbiology imeni Mechnikov -- a new method of determining the immunogenicity of antirabies vaccine by intracutaneous infection of mice; the Odessa Institute also reported on brucellosis gamma globulin; the Institute of Epidemiology and Microbiology imeni Gamaleya, Academy of Medical Sciences USSR -- improvement of dry smallpox vaccine by the selection method; and the Moscow Institute of Vaccines and Sera imeni Mechnikov -- mass production of dry sheep pox vaccine and a method of preventing bacterial contamination of the vaccine. Another report from this institute concerned experimental study of antirabies gamma globulin. A specific anti-whooping cough gamma globulin prepared from serum of immunized horses was also described at the conference.

85. Medical Museum of the Soviet Union Organized Within the Academy of Medical Sciences USSR

"In the Presidium of the Academy of Medical Sciences USSR" (unsigned article), Moscow, Vestnik Akademii Meditsinskikh Nauk, No 1, Jan/Feb 58, p 91

To improve the knowledge of medicine and medical hygiene developments among the masses, the Ministry of Health USSR has agreed to organize within the system of the Academy of Medical Sciences USSR a Medical Museum of the Soviet Union. The museum's aims are to spread medical knowledge by means of permanent and mobile exhibits, to acquire scientific data on medical, medicotechnical, and public health achievements in the country, to collect information on medical history, and to keep and collect information on memorials and deaths of famous scientists.

86. Soviet Clinicist-Therapeutist, M. V. Chernorutskiy, Dies

"M. V. Chernorutskiy" (unsigned article), Moscow, Vestnik Akademii Meditsinskikh Nauk SSSR, No 1, Jan/Feb 58, p 96

Prof Mikhail Vasil'yevich Chernorutskiy, Active Member of Academy of Medical Sciences USSR, Honored Worker of Science of the RSFSR, and an outstanding Soviet clinicist-therapeutist, died on 10 July 1957 in his 73d year.

Chernorutskiy was a graduate of the Military Medical Academy and had been a professor at the First Leningrad Medical Institute since 1920, and since 1950 he had also been the head of the Therapy Sector, Institute of Physiology imeni I. P. Pavlov, Academy of Sciences USSR.

87. Otolaryngology Scientific Conference in Riga

"First Interrepublic Scientific Conference of Otolaryngologists of the Estonian, Lithuanian, and Latvian SSRs," by Prof N. D. Khodyakov, chairman of the Administration of the Society of Otolaryngologists, and M. B. Zabutyy, secretary of the conference; Moscow, Vestnik Otorinolaringologii, No 6, Nov/Dec 57, pp 114-117

The first interrepublic scientific conference of otolaryngologists of the Estonian, Lithuanian, and Latvian SSRs, was held from 31 January to 2 February 1957 in Riga. The conference was convoked by the Republic's Scientific Societies Organizational Committee of the Scientific Council, Ministry of Health Latvian SSR.

The program included: (1) the organization of therapeutic aid; (2) the diagnosis, treatment, and prophylaxis of angina and tonsillitis; (3) tumors and infectious granuloma; (4) trauma of otorhinolaryngologic organs; and (5) diagnosis and treatment of certain diseases of the ear, nose, and throat.

The conference was attended by 156 persons, and 40 reports were given.

88. Slovak Academician 60 Years Old

"Academician Ladislav Derer 60 Years Old," by "Workers of Your Department of Clinical Physiology of the Institute of Experimental Medicine, Slovak Academy of Sciences," Bratislava, Nasa Veda, No 12, Dec 57, pp 546-548

The 1 1/2-page article, including a photograph of Derer is a biography of Academician Derer, a scientist, clinician, and physician, born in Bratislava on 11 December 1897. The article praises him and his work very highly.

89. Yugoslav Physicians Graduated

"A New Group of Physicians Graduated" (unsigned article), Sarajevo, Oslobodjenje, 29 Dec 57, p 8

The Faculty of Medicine in Sarajevo graduated 22 new physicians on 28 December 1957. Prof Dr Predrag Aranicki, dean of the faculty, sponsored the graduates. The new graduates are Borislav Filipovic, Sead Idrizbegovic, Rizah Hrujic, Nadzida Terzic, Tomislav Veljanovic, Marija Donabudovic, Nezir Fazlic, Muhamed Gavranovic, Slobodan Jokic, Ksenija Nikolic, Milica Fresto, Marija Lukic, Veselin Mijatovic, Anra Tomic, Zanka Ilic, Milka Momc, Radmila Prsic, Djordje Jarosevic, Kornel Koler, Adela Stak, Vera Todic, and Visnja Savic.

VII. METALLURGY

90. Status of High-Temperature Carbide Materials in East Germany

"Status of the Development of High-Temperature Carbide Materials in the German Democratic Republic," by F. Thuemmler and G. Blum; Berlin, Neue Huette, No 12, Dec 57, pp 762-763

For the past 18 months VEB Hartmetallwerk, Immelborn, has been engaged in research on a laboratory-scale production and a testing of the following titanium-carbide combinations for use in turbine construction: TiC-TaC-Co-Ni-Cr, TiC-TaC-Co-Ni, TiC-TaC-Ni, and TiC-Cr<sub>3</sub>C<sub>2</sub>-Ni. The results of tests on the physical properties of these combinations are given in five tables included in the article. The results give reason to hope that an improvement of these carbide materials will be forthcoming. At present, work is being done on the manufacture of entrance buckets for turbines. The difficulties encountered in the production of large parts stem from the unsatisfactory quality of the vacuum sintering installations at Immelborn (higher vacuum and better temperature control necessary).

91. Trends in the Development of High-Temperature Metallography in USSR

"Trends in the Development of High-Temperature Metallography," by M. G. Lozinskiy, Doctor of Technical Sciences, Institute of Machine Science, Academy of Sciences USSR; Moscow, Metallovedeniye i Obrabotka Metallov, No 11, Nov 57, pp 18-42

The numerous research trends in high-temperature metallography can be divided into two groups: research on the microstructure of heated metals and alloys and various methods of studying the properties of materials over a wide range of temperatures. Accordingly, the author discusses fundamental conditions during the study of microstructure of heated metals and alloys, and apparatus for investigating the microstructure of metals and alloys at high temperature heating in a vacuum. Some examples of an investigation of the microstructure of metals and alloys under high temperatures are given. Certain peculiarities of deformation and of kinetics of austenite grain growth are considered, and selective color oxidation is discussed.

A 23-item bibliography is entirely Soviet.

92. East German Welding Techniques Specialist Dies

"Personalities" (unsigned article), Berlin, Technische Gemeinschaft, No 12, Dec 1957, p 573

Max Bartsch, engineer, member of the Chamber of Technology and chairman of its "Metal Spray Techniques" Working Committee, in Bezirk Leipzig died recently at the age of 54. Bartsch worked at the VEB Leichtmetallwerk, Rackwitz (Rackwitz Light Metals Plant), as a light metals specialist since 1940. He participated in the development of weldable aluminum alloys, welding and soldering bars, and welding flux. In 1951, he conducted valuable experiments in metal spraying.

93. New Jet-Vibration Mills

"Vortex Mills." by Ye. Boleslavskaya; Moscow, Tekhnika-Molodezhi, No 1, Jan 58, pp 8-9

In the USSR the development of jet-vibration-type grinding mills is carried out at the All-Union Scientific Research Institute for Fine Grinding of Building Materials (VNIITISM) under the direction of V. I. Akunov.

The principle of operation of the vortex mill is rather simple; the material intended for grinding is introduced to the vanes of two rolls rotating in opposite directions, throwing the material with great force against the newly introduced material and breaking it by the force of impact. The productivity of such a mill is great, about 800 tons of 3-mm-size material an hour.

The vibrocavitational type of mill is suitable for superfine grinding of material down to the size of one micron.

[For additional information on metallurgy, see Item No 11.]

## VIII. PHYSICS

### Nuclear Physics

#### 94. Time-of-Flight Method Used to Measure Neutron Energies Below 0.5 Mev

"Measurement of Neutron Spectra in the Energy Range Below 0.5 Mev by the Time-of-Flight Method," by Yu. A. Vasil'yev Yu. S. Zamyatnin, P. V. Toropov, and E. F. Fomushkin; Moscow, Atomnaya Energiya, Vol 3, No 12, Dec 57, pp 542-544

A time-of-flight method is described for measuring neutron energies below 0.5 Mev. It is claimed that the method is simpler and more accurate than the use of a hydrogen-filled cloud chamber.

An account is given of measurements of the spectra of neutrons formed in the passage of 14-Mev neutrons through a layer of uranium. The time-of-flight method is used with the application of a pulsed neutron source. Neutrons were detected with a multilayer fission chamber containing 0.5 gram of U<sup>235</sup>.

#### 95. Spectra of Secondary Neutrons Measured

"The Spectra of Secondary Neutrons Produced by Neutrons Passing Through Various Substances," by Yu. S. Zamyatnin, Ye. K. Gutnikova, N. I. Ivanova, and I. N. Safina; Moscow, Atomnaya Energiya, Vol 3, No 12, Dec 57, pp 540-541

Results are given of measurements of the spectra of secondary neutrons produced in the passage of 14-Mev neutrons through layers of Li<sup>6</sup>, Li<sup>7</sup>, beryllium, boron, carbon, magnesium, aluminum, iron, copper, molybdenum, cadmium, antimony, tungsten, mercury, lead, and bismuth. The 14-Mev neutrons were obtained from the T(d,n)He<sup>4</sup> reaction.

The energy distribution of neutrons evaporated from an excited compound nucleus was obtained on the basis of statistical theory. This distribution is compared with the measurement, and it is noted that the difference found between the two distributions might be explained by the evaporation of neutrons from areas of local heat-up in the nucleus.

96. Resonance Absorption Integrals Measured for 42 Elements

"Measurement of Resonance Absorption Integrals of Neutrons,"  
by V. B. Klimentov and V. M. Gryazev; Moscow, Atomnaya  
Energiya, Vol 3, No 12, Dec 57, pp 507-514

Results of measuring the resonance absorption integrals of 42 elements are given. The method used in the study involved the exact measurement of the reactivity of a nuclear reactor on insertion of a given sample into the core. The method permitted measurements of neutron resonance absorption integrals in the epithermal range of the reactor spectrum.

The resonance integrals of ten of the elements had not been published previously. The remaining results are briefly compared with data of other authors.

Details on the experimental technique and the reactor used are given.

97. Angular Distribution of Scattered 2.9-Mev Neutrons Measured

"Angular Distribution of Elastically and Inelastically Scattered 2.9-Mev Neutrons," by V. I. Popov; Moscow, Atomnaya Energiya, Vol 3, No 12, Dec 57, pp 498-506

The angular distribution of elastically scattered 2.9 Mev neutrons was measured with a hydrogen ionization chamber in a ring geometry. The inelastic scattering of neutrons corresponding to an excitation of a single level or groups of levels of iron, copper, lead, and bismuth was also measured.

The integral cross sections for elastic and inelastic scattering and the transport cross sections are given.

The experimental results are compared with calculations based on the optical model of the nucleus. It is observed that the angular distributions of elastically scattered neutrons of nearly the same atomic weights differ very little from one another.

98. Design Requirements for Accelerators With "Similar Orbits" Described

"On Accelerators With Similar Orbits," by A. A. Kolomenskiy;  
Moscow, Atomnaya Energiya, Vol 3, No 8, Dec 57, pp 492-497

The conditions which magnet systems must satisfy in order that the frequency of radial and vertical betatron oscillations will be independent of particle momentum are given. The orbits in this case are said to be dynamically similar. In principle such systems must be free from any variation of the betatron oscillations, which are connected with synchrotron oscillations and other phenomena.

Both geometric and dynamic similarity of the orbits is guaranteed by the magnetic field  $H_0(\theta) \cdot (r_0/n)^{n_0}$ , where  $n_0 = \text{const}$ . The orbits are not dynamically similar in the examples of a weak-focusing sectional accelerator (racetrack) and a strong-focusing synchrophasotron which are considered. To obtain similarity in the first case it is necessary that the magnet sections have a common center, in addition to the requirement  $n_0 = \text{const}$ .

The various modifications of a ring phasotron are discussed. In the first modification the centers of adjacent magnet sections are on opposite sides of the ring. In the second modification the centers are at one point, the center of the accelerator. The orbits are dynamically similar in the second modification, but not in the first.

The possibility of constructing a ring phasotron which allows simultaneous stable particle motion in opposite directions is shown. -- Author's abstract

99. Applications of Electron Accelerators in USSR Described

"Light-Particle Accelerators in Science and Industry," by P. K. Oshchepkov, Doctor of Technical Sciences; Moscow, Vestnik Akademii Nauk SSSR, No 9, Sep 57, pp 25-30

Applications of electron accelerators in the USSR are discussed.  
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"Experiments performed in the Institute of Metallurgy imeni A. A. Baykov, Academy of Sciences USSR, and the Physicochemical institute imeni L. Ya. Karpov to determine carbon content of titanium, zinc, and other metals on the basis of the photonuclear reaction ( $\gamma, n$ ) showed the promise of this method.  $O^{16}$  in the metal is changed to radioactive  $O^{15}$  under the influence of high-energy gamma radiation.... Carbon content is then determined by measuring half life and energy of the radiation....

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"Electron accelerators of 25-30 Mev are used to study the effect of radiation on dielectrics and semiconductors. The effect of gamma radiation on the electrical properties of semiconductors is being studied in the Ural Affiliate of the Academy of Sciences, in Tomsk Polytechnical Institute, Leningrad Technological Institute, and universities....

"At a conference on betatrons held in Moscow in mid April 1957, it was emphasized that the main problem now is to master the production of sealed-off chambers and to improve injector construction. Work done at the Moscow Transformer Factory on the development of new types of betatrons was disclosed. These are intended especially for wide application in industry and medicine.

"A diagram of one of the betatron types that was developed is shown in the figure (1).

"Considerable success has been achieved in the design and construction of 25- to 30-Mev linear accelerators. These have now passed out of the laboratory-development stage and are applicable wherever gamma and beta rays of high intensity are required....

"Problems of production control of metals and metal products, in particular high-speed gamma-ray inspection and remote testing, take on particular meaning in connection with problems of heavy-machinery building and development of continuous production methods. Application of penetrating radiation of high intensity and electronic methods of transmitting information to a control point are involved in the problem. The Electrophysical Laboratory of the Institute of Metallurgy is working on this problem....

"Another important use of light-particle accelerators is for the high-temperature treatment of metal surfaces, for alloying the surface layer with high-temperature elements, for improving plastic properties of materials, and as a catalyzer of physicochemical processes...."

(1) Photograph on page 28 of source shows a line drawing of a 25-Mev betatron which can be raised or lowered and rotated.

100. Use of Shock Waves to Obtain Extremely High Temperatures in Gases Discussed

"Results of New Physical Research (Session of the Department of Physicomathematical Sciences)" (unsigned article), Moscow, Vestnik Akademii Nauk SSSR, No 7, Jul 57, p 75

CPYRGHT At a conference held 14-15 May 1957 at the Institute of Physical Problems imeni S. I. Vavilov, Ya. B. Zel'dovich, Corresponding Member of the Academy of Sciences USSR, read a paper on shock waves in gases. The following account of the talk is given:

"The author noted that these powerful shock waves make it possible to obtain and study extremely high temperatures in gases. Dissociation of molecules into atoms and ionization of atoms take place at high temperatures. These processes cause a considerable decrease in temperature and an increase in the degree of contraction of the shock wave in comparison with the ideal calculation on the assumption of constant heat capacity over a wide temperature range from 2,000-3,000 to 2-3 million degrees.

"The flow of radiant energy as computed by Planck's formula may become comparable to the work of contraction in a shock wave at high temperatures of approximately 200,000 degrees. However, at high temperatures the radiation consists of quanta that are easily absorbed by cold air. Radiation therefore does not change the energy balance of a shock wave under any conditions. Radiant energy at high temperatures can change only the structure of the wave and thus bring about heating of the air and an increase in pressure ahead of the front. Radiant heat exchange does not eliminate, however, the pressure jump during contraction of a gas with low initial temperature. A temperature exceeding equilibrium is reached in the thin layer adjoining the plane of the pressure jump.

"When the shock wave is not too strong, the temperature reached in it may be determined on the basis of luminescence in the visible part of the spectrum. If the temperature of the wave exceeds 100,000 degrees, however, the heated air ahead of the front becomes opaque and the visible radiation corresponds to a much lower temperature. This prediction of the theory is supported by experiments.

"At temperatures when the energy of thermal motion is considerably greater than the ionization energy, the electrons and ions must be considered as two different gases. The work of contraction initially goes into heating the ions. The temperature of the ions passes through a maximum at the plane of the pressure discontinuity.

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"The speaker discussed the attenuation of the shock wave which is caused by a very brief application of pressure. An interesting feature of the problem is that it is impossible to determine the power index in the attenuation law from consideration of the dimensions and the conservation laws of mechanics. The relation of the solution for a shock wave of finite length to the limiting solution found was also discussed in the lecture...."

101. Importance of Cosmic-Ray Studies Stressed; Soviet Shortcomings Noted

"Important and Pressing Investigations: On the Significance of Work on Cosmic Rays," by N. A. Dobrotin, Doctor of Physico-mathematical Sciences; Moscow, Vestnik Akademii Nauk SSSR, No 7, Jul 57, pp 15-17

CPYRGHT The opinion that the importance of cosmic-ray studies is past with the development of the new accelerators is dealt with. It is pointed out that particles with energies to  $10^{18}$  ev are present in cosmic rays. CPYRGHT  
energies 100 million times greater than can be obtained in the largest accelerators. "...It is possible to obtain  $\mu$ -mesons of only the very lowest energies in accelerators.  $\mu$ -mesons of very high energies can be studied only in cosmic rays. There are, besides, certain indications that important and interesting characteristics occur in interactions between nuclei and high-energy  $\mu$ -mesons...." The importance of cosmic-ray studies to astrophysics is also stressed.

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The rarity of extremely high-energy events is noted, and further contacts with foreign specialists on cosmic rays are urged in this respect. CPYRGHT

CPYRGHT The importance of studying each phenomenon from every approach and the development and improvement of research methods is noted. "...It should be emphasized that our position in this respect is far from favorable. Our lag in the production of photographic emulsions is widely known; cloud chamber usage and scintillation methods are in a poor state. CPYRGHT  
Serious attention should be turned to eliminating these deficiencies...."

102. Academician Fok Describes Visit to Institute of Theoretical Physics in Copenhagen

"Journey to Copenhagen,": by Academician V. A. Fok; Moscow, Vestnik Akademii Nauk SSSR, No 7, Jul 57, pp 54-57

A month-long visit during February and March 1957 to the Institute of Theoretical Physics in Copenhagen is described by Academician Fok [sometimes spelled Fock]. The visit was made at the invitation of Niels Bohr. Excerpts for the account follow:

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"...My work at the institute consisted of delivering and attending lectures and, principally, of conversations with Niels Bohr on the main problems of quantum mechanics.

"At the request of Professor Møller, I delivered in English three lectures on relativity theory. The first lecture was on the subject, "on the Notions of Homogeneity, Covariance, and Relativity"; the second, "Approximate Solutions of Einstein's Equations"; and the third, "Gravitation Waves." Despite the fact that few physicists at the institute are working specially on problems of relativity theory, almost all the members, including Niels Bohr, attended the lectures. The discussion was very lively, since my viewpoint, differing somewhat from that of Einstein, was met with interest and understanding.

"...Besides the lectures on relativity theory, I gave a talk on my 1954 work on the theory of the helium atom. Calculations based on formulas which I derived in this work are now being made in the US and Norway....

"I cannot cover the substance of my conversations with Bohr in sufficient detail in this article. I will say only that we touched on how to combine the objectivity of atomic properties with the necessity of considering an experiment as a whole and drawing conclusions concerning atoms on the basis of instrument readings. We also discussed problems of Laplace-type determinism and of causality in the general sense, and the problem of so-called uncontrolled interaction. Bohr declared from the start that he is not a positivist and tries simply to consider nature as it is. I pointed out that many of his formulations given rise to an interpretation of his statements in a positivistic sense which, obviously he does not generally wish to give them. I emphasized the necessity of 'legalizing' all notions of quantum mechanics as reasonable abstractions based on his interpretation of an experiment. He denied that anything at all negates their legality. Our points of view gradually converged. It was made clear in particular that Bohr recognizes the objectivity of atoms and their properties; recognizes that only Laplace-type determinism should be given up, but not causality in general; and recognizes that the terminology 'uncontrolled interaction' is unfortunate and that all physical properties are in actuality controlled. Perhaps it is more correct to say that this convergence of viewpoints was only brought out in our conversations, and was arrived at earlier and independently....

"Bohr devotes much effort to strengthening ties between scientists of various countries; and there is no doubt that, thanks to Bohr's efforts, that spirit of comradeship which is so important for fruitful scientific work exists in his institute. This spirit was apparent also in the fact that during my work at the institute there came to me, sometimes with questions, sometimes simply to explain their work at the institute, young physicists from various countries: Americans, Danes, Norwegians, Frenchmen,

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Yugoslavs, Swedes, Japanese, and others. True, it can not be concluded from this that the spirit of cooperation in scientific work and the spirit of comradeship in other respects extend into the political sphere. The influence of reactionary propaganda is very strong in the West, and even progressive people in the West view many questions through altogether different eyes from ours, and see white as black and black as white. However, an important and most effective means of combating the unfavorable impression of the Soviet Union and its international role is personal contact between us and foreigners. Not only scientists, writers, artists, and athletes should visit on another, but also those that are simply tourists...."

Atomic Energy Development

103. Plans for Czechoslovak Atomic Power Plant

"Construction of the Atomic Electric Power Plant Will Begin This Year" (unsigned article), Prague, Vecerni Praha, 2 Jan 58, p 1

All preparations for the construction of the first Czechoslovak atomic power plant are to be completed during the second half of this year. It will have an output of 150,000 kilowatts. Owing to more aid from the Soviet Union a power reactor will be put into operation, which is matched in output only by reactors in the Soviet Union, England, and the US.

The first nuclear power plant will be the basis of an extensive net of Czechoslovak atomic electric power plants. Their advantage will be that they need not be located according to sources and transportation of classic fuels. Czechoslovak development in the coming years will call for a considerable increase in the consumption of electric energy. It is supposed that all increases in the need for electric energy after 1970 will be covered by nuclear electric power plants.

104. East German Atomic Energy Center

"Atoms for Life," by Paul Barthelt, Karl-Marx-Stadt, Volksstimme, Vol 13, No 18, 22 Jan 58, p 3

An East German Atomic Energy Center has been constructed in the Rossendorfer Wald near Dresden for the purpose of "producing atomic energy for peaceful uses." The center includes the Atomic Reactor Institute, which was opened on 16 December 1957; the Cyclotron Institute, in which a cyclotron from the USSR has been assembled; the Radiochemical Institute; the Raw Materials and Solids (Festkoerper) Institute; and the Institute for Techniques.

The fuel for the reactor is 10-percent enriched uranium 235, obtained from the USSR.

105. Consultative Meeting of Yugoslav Federal Commission for Nuclear Energy

"Study of Nuclear Problems for the Operation of Our Ships Will Be Initiated!" (unsigned article), Zagreb, Borba, 22 Dec 57, p 4

At the first consultative meeting recently held in the Federal Commission for Nuclear Energy (Savezna komisija za nuklearnu energiju) and attended by specialists in the field of transportation and shipbuilding from nuclear institutes and industrial enterprises and establishments, plans for atom-powered operation of vessels in Yugoslavia were considered.

It was emphasized at the meeting that the continual development of nuclear energy, of nuclear equipment, and of improvement in technical processes is reflected in progressively less expensive power obtainable from atomic equipment. The prospects for the application of nuclear energy in maritime transportation are considerable and are already represented by concrete plans in many maritime countries.

According to current analyses and concepts, it is expected that one of the first applications of nuclear power in Yugoslavia will be for atomic propulsion of ships. With the construction and use of a Yugoslav atomic reactor and a reactor research laboratory, there will be created, among other things, the basic conditions for work in the field of reactors, for the training of cadres, and for the acquisition of experience in the field of power reactors, including marine reactors.

106. East German Radiation Protection Institute

"Order on Establishment of Institute for Dust Research and Suspended Radioactive Materials" (unsigned article), Berlin, Gesetzblatt der Deutschen Demokratischen Republik, Part II, 11 Nov 57, p 286-287

This is a 22 October 1957 order issued by the director of the East German Office for Nuclear Research and Technology (Amt fuer Kernforschung und Kerntechnik) which establishes the Institute for Dust Research and Suspended Radioactive Materials (Institut fuer Staubborschung und radioaktive Schwebstoffe) in Berlin under the direction of the Office for Nuclear Research and Technology. Functions of the institute include research in the field of radioactive fallout, control against harmful radioactivity within the East German territory, and the training of experts in combating radioactive fallout and the effects of radiation.

Mechanics

107. Supersonic Aerodynamics

"Stability of a Blade Moving in a Gas," by A. A. Movchan, Moscow, Prikladnaya Matematika i Mekhanika, Vol 21, No 5, Sep/Oct 57, pp 700-706

The stability of a blade, i.e., a thin rectangular plate of constant thickness with two freely attached and two free edges is investigated. The blade is assumed moving with high supersonic velocity in the direction of one free edge to the other. The excess pressure of gas is computed by an approximate formula from piston theory (A. A. Il'yushin, PMM, Vol 20, No 6, 1956). As in the case of panels secured around their entire periphery, flutter of the blade is possible. But, in contradistinction to panels, divergence of the blade may occur, with compressing forces absent and even with elongation wherein the critical velocity of divergence essentially depends on the Poisson coefficient. The accurate determinations of critical flutter velocities and of divergence are cumbersome. It is shown that for the evaluation of the preflutter region, results formerly obtained for panels (A. A. Movchan, PMM, Vol 21, No 2, 1957) may be applied.

108. Simpler Method for Investigating Small Dynamic Systems Found

"Stability in Small Dynamic Systems Containing Small Parameters," by N. A. Kartvelishvili, Moscow; Moscow, Izvestiya Akademii Nauk SSSR, Otdeleniye Tekhnicheskikh Nauk, No 9, Sep 57, pp 19-26

The investigation of the stability of dynamic systems with a large number of degrees of freedom and in particular of power systems involves difficult operations on cumbersome characteristic equations. For this reason the question arises whether it is possible to reduce the investigation of the characteristic equation to an investigation of several more simple equations.

The author did not consider the case when it is possible to successfully reduce the investigation to the product of two or more determinants, as is done in the case of independent control of turbines, used in a heating system by neglecting some small (not diagonal) elements of the characteristic determinant.

The simpler procedure is possible when part of the differential equations for small oscillations of the system contains small time constants.

109. Supersonic Flow Investigated by Volterra's Method

"Investigation of Supersonic Flows With the Help of Volterra's Integral," by A. I. Utkin; Moscow, Doklady Akademii Nauk SSSR, Vol 116, No 3, Sep 57, pp 369-372

Volterra's method is used to investigate the problem of linear supersonic flow past axially symmetric surfaces. A Volterra integral is reduced by a series of transformations to a linear integral equation of the second order which is solvable by the methods of calculus or series.

110. Theoretical Study of Re-entry Problem

"Motion of a Plate of Infinite Span Near the Free Surface of an Ideal Weightless Fluid," by Ye. A. Fedorov; Moscow, Doklady Akademii Nauk SSSR, Vol 116, No 3, Sep 57, pp 373-376

A solution obtained by Kirchhoff's method is given for the motion of a plate of infinite span near the free surface of an ideal weightless fluid. The currents in which the upper surface of the plate is partially or completely washed by the flow of fluid are considered, as well as limiting cases in which the separation of free jets occur directly from the leading edge of the plate.

111. Fixed Temperature Field in Thin Shell of Arbitrary Form Approximately Solved

"Approximate Solution of the Problem of a Fixed Temperature Field in a Thin Shell of Arbitrary Form," by V. I. Danilovskaya, Moscow, Izvestiya Akademii Nauk SSSR, Otdeleniye Technicheskikh Nauk, No 9, Sep 57, pp 157-158

An approximate solution is given for the problem of a fixed temperature field in an arbitrary, thin shell of constant thickness. It is assumed that the temperature varies quadratically with respect to shell thickness. The solution to the problem, in integral form exactly satisfies boundary conditions, the conditions at the front ends of the shell, and approximately satisfies the equations of heat transfer.

112. Analysis of Stability Problem

"Stability of an Elastic-Plastic Rectangular Plate, Compressed in One Direction," by Yu. R. Lepnik, Tartu; Moscow, Prikladnaya Matematika i Mekhanika, Vol 21, No 5, Sep/Oct 57, pp 722-724

The stability problem of elastic-plastic plates usually is solved by the approximate method of A. A. Il'yushin (Plastichnost' [Plasticity], 1948). More accurate solutions are attempted as a continuation of the writer's previous work ("A Certain Possibility of Solving the Stability Problem of Elastic-Plastic Plates by an Accurate Method," Izvestiya AN SSSR, No 8, 1957). Here, two stability problems of rectangular plates -- the case of a plate fixed along its contour, and the case of a freely attached plate -- are solved with full accuracy.

Miscellaneous

113. Hungarian Scientists Attend Spectroscopic Conference in Dresden

"Hungarian Scientists Abroad" (unsigned article), Budapest, Nepakarat, 23 Nov 57, p 4

Laszlo Lang, Tibor Matrai, and Bruno Vorsatz, workers at the Central Physics Research Institute (Kozponti Fizikai Kutato Intezet), left for East Germany to attend the Spectroscopic Conference in Dresden sponsored by the East German Physics Society.

114. Hungarian Academician Attends Spectroscopy Conference in Jena

"Hungarian Scientists Abroad" (unsigned article), Budapest,  
Nepakarat, 14 Nov 57, p 4

Istvan Kovacs, Corresponding Member of the Hungarian Academy of Sciences (Magyar Tudományos Akadémia), was in charge of the Hungarian delegation of physicists which participated in the Spectroscopy Conference in Jena.

IX. MISCELLANEOUS

115. Plans for the Application of Science to Industry

"The Plan and Science," by Academician A. Blagonravov and B. Semkov; Moscow, Izvestiya, 7 Feb 58, p 2

CPYRGHT

"Our country is preparing to compile a plan for the development of the USSR for 1959-1965. In connection with this, it would be desirable to express a series of thoughts having a direct bearing on the planning of science and the technical process.

"The first experience in major state long-term planning was the GOELRO (State Commission for the Electrification of Russia) plan. It was remarkable for its exclusive direction and clarity. Planning at that time was aimed at pointing out the main idea, which was to put the new technological base -- electrification -- under the national economy. Science made possible the realization of this goal. The principles and methods included in the fundamental make-up of the GOELRO plan still have value today.

"The state plan for the development of the national economy for the coming years is aimed primarily at the solution of the principal economic problem of the USSR -- to catch up with and surpass capitalist countries, including the US, in the production of products per capita. In connection with this, contemporary science must, as in the fulfillment of the GOELRO plan, not only put forth all that it has in reserve, but also solve new problems which will arise.

"Shortening the period during which scientific endeavors leave the laboratory and reach the production line must be the basis in the planning of work. In the past, scientific results were greatly held up, sometimes 50-100 years. Today, this is being considerably reduced. For example, it took nearly 50 years before an electric motor was made after the discovery of electromagnetism, but the period from the splitting of a uranium atom in the laboratory to the establishment of the first atomic electric power station took no more than some 10 years. It is not difficult to see that here, indeed, is the solution which must be grasped in the competition with capitalist countries in the field of technology.

"Where is the means which can be utilized to curtail these lags? Practice shows that it must be found in good organization and in the concentration of forces and means of selected direction.

"The goal stipulated in the plan must be ensured with all necessary factors: scientific research and design forces, experienced production, material resources . . .

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28 MARCH 1958

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REPORT NUMBER 3

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"One must admit, however, that these conditions are by far not observed in all, or even in the most important directions of technical progress. For example, there is no planning of this type in the field of automation of production processes. In its own right, the problem of automation in industry is comparable with the technological rearmament of the national economy which was fulfilled on the basis of electrification. It is not for nothing that the 20th Congress of the Communist Party of the Soviet Union granted it such great importance.

"At present various branches of industry have compiled special plans for the change-over of certain enterprises to complex automation. Mention must be made of the experience gained at the Lisichansk Chemical Combine which, together with scientific research and project planning organizations, worked out a plan for the complex automation of the production of ammonia and achieved success. Complex automation is also found at the Moscow Petroleum Refinery Plant. But only a few enterprises have followed this course. In most cases, this work is not done, since an enterprise by itself, without a general directive plan and without the assistance of scientific institutes and design bureaus, is unable to do it.

"It frequently happens that available and tested experience is not widely disseminated. In the construction of the Kuybyshev Hydroelectric Power Station, for example, there was built in 1955 a completely automatic continuous-operation concrete plant. The advantages of the automatic enterprise are quite clear. But the Ministry of Electric Power Stations for some reason continues to build the old type of nonautomatic and uneconomical plants.

"The various omissions in planning are explained, in part, by the fact that the directing hand of Gosplan USSR is not sufficiently felt. Within the apparatus of Gosplan, there is no organ which would channel the work in the field of automation of production processes according to branches and which would conduct uniform technological instruction. By the same token, the compilation of plans for automation for each enterprise could easily be placed in the basic parts of the general plan of the automation of production processes.

"It is expedient to compile similar plans for other important aspects of technical progress. This is what is meant by special planning. It differs entirely from the currently accepted method of individual planning of scientific research, design, and experimental work. The special plan provides for the working out of all aspects necessary for technological progress. Such organization of work and concentration of forces and methods will undoubtedly curtail the lag in applying results of scientific research for production.

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"We have some experience in such planning, on gas turbines, among other things. This experience should improve the method of compiling such plans. The plan on gas turbines is calculated for several years. It determines the type of turbines necessary for development and production, etc. The plan establishes the distribution of work among the participants and indicates the measures for the organizational and material guarantee of work; in other words, it takes into consideration everything for placing the results of research into production.

"Project plans on the most important problems of technical progress must serve as a supplement to the over-all plans for the development of the national economy. The state plans for scientific research work in the past were compiled rather simply. The proposals of ministries and departments were united into a single plan without sufficient critical analysis and generalizations. These plans became unwieldy. They contained many insignificant works of individual or local significance, and it was difficult to discover the main problem. All this led to the dissipation of forces and means.

"To determine the most important direction for technical progress is considerably harder than to compile a summary plan from the proposals of institutes, as has occurred in the past. Even all the important problems cannot be considered equal. Some must be given preferential conditions for their development. Take, for example, computer engineering. The lack of production of high-speed computer machines is explained largely by shortcomings in planning. We have a number of fully tested machines, the "BESM," "M-2," and "M-3"; however, there is only one of each available. They have not yet been placed into series production. Although computer engineering is of great importance, we still do not have a plan for its development in the immediate future.

"In the determination of the most important directions, it is imperative to have in mind that science and technology develop extraordinarily fast. This must be taken into account, not only in the compilation of a plan, but in the process of fulfilling it by means of corresponding adjustments.

"It follows then, that work in the selection of the principal directions must necessarily be introduced into the system. Scientific institutions and scientific-technical societies must be drawn into this work. Periodic scientific conferences in various fields must be devoted to problems of this type.

"Of considerable importance is the putting out of scientific-technical information. We have, thus far, considerable shortcomings in this. We have perhaps too many establishments which are concerned with this business. They are found in the principal institutes, in sovnarkhozes (councils of national economy), and in the republics. Many are employed in them, and considerable expense occurs. But for the most part, these establishments work separately and duplicate each other.

"Of considerable significance are the simultaneous final processing and finishing of obtained scientific results to a form suitable for application to industry and with a recommendation for continued research. This should accelerate scientific accomplishments for industry. It is important that research results be given over for final processing immediately on the receipt of encouraging data.

"Highly characteristic in this respect is the process for the development and use in the national economy of the new chemical substances -- polymers. Hitherto, this scientific trend was only investigative. Now this achievement of science is being applied in practice. In addition, research has not ceased. The use of polymers gives rise to new scientific problems, which can be solved only through further research.

"This combination of scientific work, with its parallel practical application, is characteristic of most similar research. It is necessary to establish a procedure through which the important results of scientific research are snatched up at the origin, so that scientific institutions would not have to appeal to anyone in the process of realization of their achievements. Conditions for this have now been set up through which there are no obstacles for the planned transference of the achievements of the Academy of Sciences USSR into the network of principal institutes and design bureaus.

"We must admit that frequently the transference to industry of already worked-out achievements progresses with considerable difficulty. This occurs because the introduction of new developments in establishments takes away considerable time in the revamping of the technology of production, which naturally disturbs the fulfillment of the programs. One must take this into consideration. Work must be so organized that the transference to a new production and technology would reflect as little as possible on the systematic output of production. This could be achieved if all that is necessary for the transference be prepared beforehand. This requires organization in the establishments of a special service for technological progress.

"We have in our establishments the services of a mechanic, a chief technologist, but there is no service for technological progress, although there are the organizations which go into it. Included in these are plant design and technological bureaus, laboratories, and shops for control and measuring instruments. Why then, cannot all these be unified into a special service which would take care of continuous improvements in the industry and the preparation of all things necessary for the transference to new production and new technology?

"The transition to new forms of administration of industry has given rise to concrete problems in the organization and planning of science and its application to production. It is necessary to systematically study these problems and then improve the applicable methods."

116. Awards Given to Soviet Scientists

"Prizes for Outstanding Scientific Works of 1957" (unsigned article); Baku, Bakinskiy Rabotnik, 4 Feb 58

The Prize imeni M. V. Lomonosov was awarded to Ye. M. Livshits, Doctor of Physicomathematical Sciences; B. V. Deryagin, Corresponding Member of Academy of Sciences USSR; and I. P. Abrikosova, Candidate of Physicomathematical Sciences for their work in the investigation of the molecular forces of attraction between heavy bodies. The Prize imeni P. L. Chebyshev was awarded to N. M. Korobov, Doctor of Physicomathematical Sciences, for his original work on the theory of numbers. The Prize of the Presidium of the Academy of Sciences USSR was awarded to Prof A. A. Shakhov, Doctor of Biological Sciences, for his monograph, Soleustoychivost' rasteniy (Viability of Plants in the Presence of Salt); to Academician A. L. Kursanov and others for their study of the root system as the organ of metabolism; and to N. M. Sisakyan, Corresponding Member of the Academy of Sciences USSR, and others for their investigation of the biochemical function of plant cells.

117. Position Vacancies in Moscow State University imeni M. V. Lomonosov

"The Moscow State University imeni M. V. Lomonosov Announces Competitions" (unsigned article); Moscow, Vechernyaya Moskva, 13 Jan 58, p 4

The Moscow State University imeni M. V. Lomonosov announced competitions for the following position vacancies: head (professor) of the Chair of Theoretical Mechanics (Kafedra Teoreticheskoy Mekhaniki) of the Mechanics-Mathematics Faculty; head (Doctor of Sciences) of the Laboratory of Cosmic Rays (Laboratoriya Kosmicheskikh Luchey) of the Institute of Nuclear Physics; and head (Doctor of Sciences) of the Laboratory of Nuclear Radiations (Laboratoriya Yadernykh Izlucheniye) of the Institute of Nuclear Physics.

118. Federal Council for Scientific Work of Yugoslavia

"Decision on Appointment of Members of the First Federal Council for Scientific Work," by Aleksandar Rankovic, vice-president of the Federal Executive Council; Belgrade, Sluzbeni list FNRJ, Vol 14, No 4, 29 Jan 58, pp 69-70

On the basis of Article 104 of the Law on Organization of Scientific Work, published in the No 34, 1957, issue of Sluzbeni list FNRJ, the Federal Executive Council has appointed the following persons as members of Yugoslavia's first Federal Council for Scientific Work (Savezni savjet za naucni rad):

President -- Milentije Popovic, member of the Federal Executive Council

Members -- Dr Ivo Babic, full professor at the Veterinary Faculty in Zagreb; Dr Kresimir Balenovic, full professor at the Faculty of Natural Sciences and Mathematics in Zagreb; Dr Milan Bartos, state counselor in the State Secretariat for Foreign Affairs; Vlado Begovic, director of the Institute of Social Sciences in Belgrade; Dr Aleksandar Belic, full professor at the Faculty of Philosophy in Belgrade; Dr Radivoje Berovic, full professor at the Medical Faculty in Belgrade; Dr Dusan Calic, full professor at the Faculty of Economics in Zagreb; Engr Alojz Dular, state counselor in the Federal Bureau of Economic Planning; Dr Jovan Djordjevic, president of the Legal Council of the Federal Executive Council; Dr Ilija Djuricic, full professor at the Veterinary Faculty in Belgrade; Dr Joze Goricar, full professor at the Faculty of Law in Ljubljana; Vojin Guzina, governor of the National Bank of Yugoslavia; Dr Radoslav Jovanovic, associate professor at the Technical Faculty in Sarajevo; Engr Kemal Kapetanovic, chief metallurgist of the Zenica Ironworks; Blaze Koneski, associate professor at the Faculty of Philosophy in Skoplje

Also, Dr Blagoje Kovacevic, full professor at the Medical Faculty in Sarajevo; Bozidar Kraut, lieutenant colonel general (Generalpotpulkovnik), chief of the Administration for Military-Technical Research (Uprava za vojno-tehnicka istrazivanja) of the State Secretariat for National Defense; Dr Engr Anton Kuhelj, full professor at the Faculty of Mining, Metallurgy, and Chemical Technology in Ljubljana; Dr Djuro Kurepa, full professor at the Faculty of Natural Sciences and Mathematics in Zagreb; Dr Bozidar Lavric, full professor at the Medical Faculty in Ljubljana; Dr Engr Djordje Lazarevic, full professor at the Faculty of Construction in Belgrade; Engr Zvonko Madjaric, director of the Bureau for the Development of Agriculture in Osijek; Milka Minic, member of the Executive Council of Serbia; Dr Tomica Nikcevic, associate of the Historical Institute of Montenegro; Dr Stevan Nikolic, president of the Yugoslav Society for Soil Research; Dr Gojko Nikolic, lieutenant colonel general, chief of the Medical Administration of the Yugoslav Army (Sanitetska uprava JNA); Dr Marijan Pavsic, director of the Scientific Bureau (Znanstveni zavod) in Ljubljana; Dr Anton Peterlin, full professor at the Faculty of Natural Sciences and Mathematics in Ljubljana; Dr Kosta Petkovic, full professor at the Faculty of Natural Sciences and Mathematics in Belgrade; Architect Branko Petricic, director of the Bureau of Urban Planning (Urbanisticki zavod) in Belgrade

Also, Engr Boris Pipan, director of "Tehnogradnja" (Technical Construction) in Maribor; Engr Slavko Pop-Antoski, associate professor at the Faculty of Agriculture and Forestry in Skoplje; Dr Pavle Savic, full professor at the Faculty of Natural Sciences and Mathematics in Belgrade; Dr Engr Petar Serafimov, associate professor at the Technical Faculty in Skoplje; Dr Sinisa Stankovic, full professor at the Faculty

of Natural Sciences and Mathematics in Belgrade; Dr Andrija Stampar, full professor at the Medical Faculty in Zagreb; Dr Alojz Tavcar, full professor at the Faculty of Agriculture and Forestry in Zagreb; Engr Ljubo Trinajstić, technical director of the "Pliva" Pharmaceutical Products Factory in Zagreb; Engr Aleksandar Trumić, associate professor at the Technical Faculty in Sarajevo; Engr Zdravko Turk, docent at the Faculty of Agriculture and Forestry in Ljubljana; Engr Viktor Turnšek, director of the Bureau for Testing of Materials and Structural Parts in Ljubljana; Engr Sigismund Volf, technical director of the "Servo Mihalj" Combine in Zrenjanin; Todor Vujasić, president of the Federal Chamber of Industry in Belgrade; Engr Branko Zezelj, director of the Institute of Materials Testing of Serbia; and Dimitrije Zivković, chief of the General Directorate of Yugoslav Railroads in Belgrade.

119. Yugoslav Scientists Receive Awards

"Seventeen Serbian Scientific Workers Rewarded" (unsigned article); Belgrade, Politika, 24 Dec 57, Vol 54, p 4

On 23 December 1957, at a meeting convened in Belgrade, the Council for the Culture of Serbia (Savet za kulturu Srbije) issued an order for the distribution of awards to Serbian scientific workers. Draza Marković presided at the awards meeting, which approved the recommendations of the commission established in October 1957 for the distribution of awards to outstanding Serbian scientific workers. On the basis of the recommendations, each of the following academicians received a 500,000-dinar award: Dr Aleksandar Belić, president of the Serbian Academy of Sciences (pretsednik Srpske akademije nauka); Dr Milutin Milanković, vice-president of the Serbian Academy of Sciences; and Dr Djordje Nesic, professor at Belgrade University.

Each of the following received a 300,000-dinar award: Dr Milos Djuric, professor of the Philosophy Faculty at Belgrade; Engr Branko Zezelj, director of the Serbian Institute for Materials Testing (director Instituta za ispitivanje materijala NR Srbije); Engr Dimitrije Certić and Engr Bosko Petrović, associates in the aforementioned institute; Engr Djordje Lazarević, professor in the Engineering Faculty at Belgrade and Corresponding Member of the Serbian Academy of Sciences; and Dr Petar Martinović, scientific associate in the "Boris Kidric" Institute.

Each of the following received a 200,000-dinar award: Dr Vojislav Avakumović, professor in the Advanced Pedagogical School (Visa pedagoška škola) in Novi Sad; Dr Radoslav Andjús, docent in the Natural Sciences and Mathematics Faculty (Prirodno-matematički fakultet) at Belgrade; Engr Geza Bata, scientific associate in the "Engr Jaroslav Černi" Hydrotechnical Institute; Dr Engr Mladen Boreli, docent in the Engineering Faculty at Belgrade and associate in the aforementioned institute; Dr Branislav Janković,

docent in the Pharmaceutical Faculty at Belgrade; Dr Engr Slobodan Koncar-Djurdjevic, associate professor of the Technological Faculty (vanredni profesor Tehnoloskog fakulteta) in Belgrade; Dr Mihailo Mihailovic, docent of the Natural Sciences and Mathematics Faculty in Belgrade; and Dr Vojislav Mistic, scientific associate in the Biology Institute.

The selections committee was made up of the following: Dr Stevan Jakovljevic, president of the committee, professor in the Pharmaceutical Faculty and member of the Council for the Culture of Serbia; Academician Dr Sinisa Stankovic, president of the Academic Council of Yugoslavia (pre-tsednik Akademiskog saveta FNRJ) and director of the Biology Institute; Dr Vojislav Djuric, professor in the Philosophy Faculty and member of the Council for the Culture of Serbia; Dr Vukic Micovic, professor in the Natural Sciences and Mathematics Faculty; Dr Veljko Korac, Philosophy Faculty professor; Engr Branko Zezelj [identified above]; Engr Miodrag Nastasovic, secretary of the Council for Urbanism and Communal Affairs of Serbia (sekretar Saveta za urbanizam i komunalne poslove NRS); Academician Dr Vojislav Miskovic, secretary of the Natural Sciences and Mathematics Division of the Serbian Academy of Sciences (sekretar Odeljenja Prirodno-matematskih nauka SAN); Dr Radivoje Berovic, Medical Faculty professor; Architect Djurdje Boskovic, Architectonics Faculty professor and director of the Architectural Institute of the Serbian Academy of Sciences; and Dr Milos Radojkovic, Faculty of Law professor.

The aforementioned awards were presented for the following scientific activities and achievements:

Dr Aleksandar Belic, as teacher and head of the Department of South Slavic languages at the University of Belgrade and as member and president of the Serbian Academy of Sciences in Belgrade, has taught linguistic science for a number of decades.

Dr Milutin Milankovic, for many years a teacher of applied mathematics at the University of Belgrade, began his work in the field of technical sciences. On his arrival at the University of Belgrade, he devoted his attention to the exact sciences, gradually mastering celestial mechanics, theoretic physics, applied mechanics, and cosmic physics. Milankovic's main scientific work, his mathematical theory of earth radiation and climatic fluctuations, aroused the attention of world science.

Prof Dr Djordje Nesic, one of the founders of the Medical Faculty in Belgrade and one of its first full professors, was the founder of Serbian ophthalmology. His numerous scientific works include two textbooks for students of medicine and a textbook for army doctors.

Dr Milos Djuric, famed authority, interpreter, and translator of ancient Greek literature, translated the tragedies of Aeschylus into Serbo-Croatian in 1956.

Engineers Branko Zezelj, Dimitrije Certic, and Bosko Petrovic designed prefabricated crossbar-type prestressed concrete high-tension line towers.

Engr Djordje Lazarevic developed a new solution for the problem of constructing tunnel linings under pressure through anisotropic hilly terrain.

Dr Petar Martinovic, who has been working for many years in the field of experimental histology, primarily on the transplantation and explantation of postembryonic endocrine glands of mammals, succeeded in transplanting the embryonic head of a chick to another embryo.

Dr Vojislav Avakumovic, noted for his work on the characteristic values in the theory of partial equations and on Green's functions of elliptic integrals, has as a result been chosen to lecture this semester, in the rank of full professor, on the theory of partial differential equations at the University of Göttingen. Dr Avakumovic has lectured at the universities in Zagreb, Ljubljana, Lund, Giessen, and Budapest.

Dr Radoslav Andjus has contributed a great deal to the solution of the problems involved in hypothermy, primarily to the revival of artificially cooled warm-blooded organisms (rodents and monkeys). Using Dr Andjus' methods, it is possible to revive clinically dead organisms, which have been cooled to below the freezing point of tissue.

Engr Geza Bata, who has distinguished himself in the field of hydraulics, contributed considerably to the solution of the problem of determining the dimensions of conduit canals for water-power systems, such as the Vlasina-Vrta Hydroelectric Power System.

Dr Engr Mladen Boreli, who has had a number of works published at home and abroad on the movement of water in porous soils, had the results of his work applied at the Mavrovo, Kokin Brod, and other hydroelectric power systems.

Dr Branislav Jankovic is working on immunology, especially on research on the mechanism and role of antibodies in some blood diseases.

Dr Engr Slobodan Koncar-Djurdjevic presented a new method for testing the mechanism of chemical apparatus, which is significant not only for chemical engineering, but also for hydraulics, aerodynamics, corrosion, and the science of heat.

Dr Mihailo Mihailovic distinguished himself for his works in organic chemistry, especially for his work on reduction with the aid of lithium aluminum hydride and for his work on determining the structure of the antibiotics echinomycene and acetomycene.

Dr Vojislav Misic's monographs on Yugoslav beech forests, the first of this kind to be published in Yugoslavia, show that the Balkan beech is different from the beech of northern and western Europe and are very significant contributions to the effective administration of Yugoslav beech forests.

120. Three Yugoslavs Receive Doctor's Degrees

"Three New Doctors of the University of Sarajevo," by D. L., Sarajevo, Oslobodjenje, 29 Dec 57, p 8

Dafina Bajic, Bogumil Hrabak, and Veroljub Vukovic received on 28 December 1957 the Doctor of Sciences degree at ceremonies attended by Dr Edhem Ceme, rector of the University of Sarajevo; Dr Anto Babic, dean of the Faculty of Philosophy; and Dr Vaso Butozan, dean of the Veterinary Faculty.

Dafina Bajic received her doctorate in the biological sciences; her dissertation covered the flora and fauna of Hutovo marsh. In 1947 she was appointed assistant in the Advanced School for Mountain-Area Management (Visoka skola za planinsko gazdovanje) in Sarajevo, and later as lecturer in the Faculty of Agriculture and Forestry in Sarajevo.

Bogumil Hrabak's dissertation was entitled "The Export of Cereals and Vegetables From Dubrovnik to the Turkish Empire in the 15th to 17th Centuries." He was appointed professor of a secondary school in 1951 on graduation, and later as assistant in the Faculty of Philosophy in Belgrade.

Veroljub Vukovic graduated from the Veterinary Faculty in Sarajevo in 1950, where he has been an assistant since 1952. His dissertation discussed problems of internal veterinary medicine.

121. Chamber of Technology Founder Awarded

"Awarded the Order of Meritorious Achievement," (unsigned article); Berlin, Technische Gemeinschaft, No 12, Dec 57, p 533

Max Guenther, member of the Presidium of the Chamber of Technology in East Germany, has been awarded the Fatherland Order of Meritorious Achievement. Guenther is well-known as the cofounder of the Chamber of Technology, as its vice-president, and as chief of the Industrial Conveyances Committee (Foerderungsausschuss). (The article contains a photograph of Guenther.)

122. East Germany Industrial Science and Standardization Specialist Given Award

"Hero of Labor" (unsigned article), Berlin, Technische Gemeinschaft, No 12, Dec 57, p 532

Prof Dr Engr Koloc has been awarded the title of Hero of Labor for popularizing and introducing new work methods in socialist enterprises. Koloc is responsible for developing the Technical Cabinet of the Institute for Industrial Sciences and Standardization in the Dresden Advanced School of Technology and has written on technical norm-setting and standardization. During the years of development of this school, he was appointed rector magnificus. He has held the following offices: member of the Main Committee of the Chamber of Technology (KdT), cofounder and chairman of the chamber in the former Land Sachsen, colleague in the Presidium of the German Norm-Setting Committee, member of the People's Chamber from 1949 to 1953, and member of the Bezirk and Advanced School Supervisory Directorate of the SED (Sozialistische Einheitspartei Deutschlands, Socialist Unity Party of Germany). (The article contains a photograph of Koloc.)

123. Successful Results of the Czechoslovak Academy of Sciences

"Bountiful Successes of Work Centers of the Czechoslovak Academy of Sciences" (unsigned article); Prague, Prace, 28 Dec 57, p 3

In 1957, the institutes, laboratories, and departments of the Czechoslovak Academy of Sciences achieved great success in many scientific and technical tasks which have significance for the national economy.

The results of the studies of laying concrete in unusually high blocks, achieved by the Institute of Mathematics, will accelerate and make more economical the construction of large water installations.

Efforts in nuclear physics resolved the problems dealing with the development of reactors, and a new method of dosimeter protection of workers was developed.

Successful progress was maintained in chemistry in research on materials retarding the growth of cancerous bodies. In the area of biological sciences, a method of producing quality material for inoculation against staphylococcic infections, particularly of note in maternity hospitals and children's clinics, was worked out.

The Institute for Electrical Engineering, with the construction of large transformers, has made a significant advance.

Significant results were also achieved in the archaeological exploration of an extensive fortified area near Mikulcice.

124. Hungarian Academician on Study Tour in USSR

"Hungarian Scientists on Study Tours Abroad" (unsigned article); Budapest, Nepakarat, 29 Sep 57, p 6

Zoltan Csuros, Hungarian academician, went to the USSR on a study tour.

125. Hungarian Academician in China

"Hungarian Scientists Abroad" (unsigned article); Budapest, Nepakarat, 14 Nov 57, p 4

Alfred Renyi, Hungarian academician, went to Communist China on a study tour.

126. Hungarian Academician in East Germany

"Hungarian Scientists Abroad" (unsigned article); Budapest, Nepakarat, 14 Nov 57, p 4

Otto Benedikt, Corresponding Member of the Hungarian Academy of Sciences (Magyar Tudomanyos Akademia), went to East Germany on a study tour.

127. Hungarian Scientists Study in the USSR

"What Leaders of Industry Went Abroad" (unsigned article), Budapest, Muszaki Elet, 12 Dec 57, p 2

Erno Kiss, a physicist at Orion Factory (Orion Gyar), went to the USSR to study the technology of producing television picture tubes.

Erno Horvath and Gyula Vancso, chemical engineers at the Nagyteteny Rubber Factory (Nagytetenyi Gumigyar), and Bela Zincz, mechanical engineer at the Plastics Industry Research Institute (Muanyagipari Kutato Intezet), studied the manufacture and technology of PVC (polyvinylchloride) and capron products in the USSR.

Mrs Laszlo Vajta, director of the Petroleum Quality Control Institute (Asvanyolaj Minosagellenorzo Intezet), and Ervin Kerenyi, engineer and department chief of the Hungarian Petroleum and Natural Gas Research Institute (Magyar Asvanyolaj es Foldgazkiserleti Intezet) in Veszprem, went to the USSR to study the use of radioactive isotopes in the petroleum industry.

Tivadar Groholy, chief engineer at the Seismic Research Plant (Szeizmikus Kutato Uzem), and Zoltan Barlai, department chief at the Petroleum Industry Trust (Koolajipari Troszt), went to the USSR to study the technology of seismic, electrical surveying, and related work in the USSR.

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